

WINTER/SPRING 2017

a magazine
from the
California
Department
of Water
Resources

OROVILLE

INCIDENT

TRIGGERS

MASSIVE

RESPONSE

The Spillway

Following on the heels of an historic and prolonged five-year drought, the 2017 Water Year will be remembered as one of the wettest in California's history, proving once again, that California is a land of two extremes.

In this land of extremes, emergency preparedness is vital. We must be prepared for droughts, floods, earthquakes and other naturally-occurring events. The recent spillway incident at Oroville Dam is a stark reminder that the infrastructure we use to manage water across the state is also aging and vulnerable. Although built to the highest engineering standards of their day, these facilities were not designed to last forever. We will undoubtedly be making investments to improve and strengthen our infrastructure over the coming decades, but we must be prepared at all times for potential problems.

In my first few months as Acting Deputy Director of Emergency Management here at DWR, I have had the absolute privilege to work alongside many of our employees on the front lines responding to the Oroville Dam emergency. I've been through these types of events before in my previous management positions at the U.S. Army Corps of Engineers, such as the Joplin, Missouri tornado and the Wyoming floods. But for many in DWR, serving in this type of situation was a first. Regardless, the level of responsiveness, positive attitudes and dedication to the cause that I observed was both inspiring and humbling. For days and weeks on end, the people of DWR and our partner agencies put their lives on hold to attend to the emergency. And the work continues as we move to the recovery phase of the operation. This fix will not be an easy one and will be years in the making. I would like to take this opportunity to thank all of those who have been, and will continue to be, involved in the response and recovery efforts.

The key to successful response in any emergency situation is preparedness. It starts with being aware and taking action, like the simple task of packing an umbrella when the forecast calls for rain. Someone once said, "Umbrellas cannot stop the rain, but they allow us to stand in the rain." Another key is organization and order. Those who have been activated in the Oroville Dam or recent flood emergencies know that organization is most efficient when coordinated from a single point. Otherwise, even the best-intended people can contribute unknowingly to the chaos. Calm and competent leadership during such times is critical, and regardless of one's place in the organization in routine times. During an emergency, everyone must adhere to the emergency management structure, their assigned role, and follow and respect the designated leader. Those not activated in the emergency have a critical role as well, to keep the essential functions of the Department going.

Finally, I would be remiss if I did not mention the importance of positivity, good humor and laughter during times of emergency. During stressful periods, a simple smile and positive, can-do attitude will go a long way in lifting the spirits of all those around you and contributing to the success of the operation.

At DWR, we have much work to do to improve our emergency management program, but having lived through the recent event, I am assured we have the human resources, capabilities and will to accomplish great things. This is a tremendous organization and I am proud to be part of it.

— Christy Jones
Acting Deputy Director
Statewide Emergency Preparedness and Security





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On the cover

Oroville Dam's emergency and flood control spillways on February 24, 2017. Flood control spillway releases 50,000 cubic feet per second before being shut off three days later to allow for removal of 1.7 million cubic yards of debris below the spillway. Orthomosaic created from series of imagery taken from aircraft that are programmatically matched to form a new image.



A reflection ...



DWR Director Cowin (right) talks with Zone 7 Water Agency Director Quigley after a panel discussion at the Association of California Water Agencies Conference in Sacramento on May 6, 2015.

Like most everyone, from time to time I have contemplated what retirement and a next phase of life would be like, but now that the moment is upon me I find myself overcome with unexpected emotions, a flood of memories, and thoughts I sincerely want to express. My 36 years at DWR, including the last seven serving as Director, have been so much more than I bargained for when I showed up at the San Joaquin District Office in Fresno for my first professional job out of college. The idea of working as a Civil Engineer in the field of water resources was a natural one for me, having been raised on a family farm where managing water was critically important. However, my vision of what I would be doing and how long I would do it turned out to be far from accurate.

As a typical Californian, I had no idea of the challenges we face and the responsibility we shoulder at DWR as stewards and managers of our state's precious water resources. Over the decades, my philosophy evolved with that reflected by our society in general, from a focus on the engineering aspects of developing water supplies towards the more demanding comprehensive goal of managing water

resources sustainably while supporting our economy and protecting our environment. The interest I originally had in civil engineering and the skills I learned in training to be one were soon overshadowed by a greater curiosity in water policy development and a need for new skills necessary to participate in that realm.

I was privileged to learn from the front row what it takes to move a good idea into statute, secure and manage the budget and staff necessary to implement a program, work with stakeholders of varied and conflicting interests, coordinate and collaborate with local, federal and sister State agencies, and provide transparency and accountability to the public. The days have been rare that I have not confronted a unique challenge or learned something new. There have been moments of frustration and despair, but there have been more moments of fulfillment and satisfaction. Thirty-six years have passed, but in many ways I feel like I'm just getting started.

I have seen DWR at its best and, at times, something less than its best. The attributes I have observed that are fundamental to our success are knowledge, hard work, and above all, communication. When things get off track, more often than not it can be corrected with some additional face-to-face and honest communication. As I said at a recent



• Cowin graduates from Stanford University with a Bachelor of Science degree in Civil Engineering. His DWR career begins at the San Joaquin District office in Fresno as a Junior Civil Engineer.

• Supervising Engineer

• Chief of Storage Facilities Unit for the CALFED Bay-Delta Program

1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998

management workshop, I believe that key qualities for a prospective manager at DWR are resolve and empathy -- in equal parts. We must be determined to make progress, but that progress will be more durable if we take time to thoroughly understand other interests and points of view along the way. It's natural for leaders in a big organization like DWR to seek success for their individual projects and programs. But we are at our best when every employee is first committed to our Department's overarching mission.

In the last decade, the debate over water in California has shifted. As the threats of global climate change have become better understood and extended drought has brought the topic of water into household conversations, the importance of investing in our water resources and implementing a greater public commitment to efficient water use has been underscored. While there are still plenty of details to debate, many long-lasting impasses have been broken. Governor Brown's Water Action Plan has provided a broadly supported and accessible road map for preparing for the future. The changing paradigm of public opinion has provided opportunity for a quantum advancement of water policy, including new guidance and funding for flood management; financial incentives for integrated water management; higher standards for measuring water use, water conservation, and drought contingency planning; modernizing the State Water Project, and -- of tremendous importance -- the first comprehensive groundwater management statutes in California history.

DWR has been critical to these advancements. We have always had champions throughout this organization who routinely go above and beyond to make new initiatives successful despite daily obstacles. Each DWR employee plays an important part in moving the organization forward. The competency and successful track record of our Department provides confidence on the part of the Legislature, water interests, and all Californians that policies will be implemented in an informed, intelligent, and thoughtful manner. That confidence has often been the tipping point in the will to act, to pass new statutes, to invest, and to ultimately advance California water policy.

I will always be proud to have devoted my career to DWR and thankful to have served with colleagues that have so often inspired me. Even as I consider life beyond DWR, I know this organization will always be part of me and I will be rooting hard for your continued success.

Thank you and best wishes to you all.

Mark W. Cowin

Mark W. Cowin, Director
California Department of Water Resources



Above to below: As part of the Folsom Dam Joint Federal Project, DWR Director Cowin signs spillway wall during event highlighting arrival of first massive gate on April 26, 2014. Cowin at a January 2014 press conference announces actions being taken to preserve water supplies during California's drought. (Left to Right) Director Cowin, Secretary of the Interior Salazar and Secretary for Natural Resources Snow participate in the groundbreaking for the construction of the Delta-Mendota Canal and California Aqueduct Intertie Project that was completed in 2012.

• Principal Engineer and serves as an Assistant Director of the CALFED Bay-Delta Program

• Cowin becomes Deputy Chief and later Chief of the Division of Planning and Local Assistance

• Deputy Director for Integrated Water Management

• During his 30th year with DWR in 2010, Cowin is appointed DWR Acting Director by Governor Schwarzenegger; Cowin becomes DWR's 10th Director in 2012

• New Groundwater Legislation

• California WaterFix

• Cowin retires

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018

Croyle Takes DWR Helm in Season of Challenges

By TED THOMAS



Croyle explains Oroville Spillway repairs to Governor Brown during his February visit.

William Croyle had barely moved into his new office as Acting DWR Director early this year when California was hit in rapid succession by pounding storms, a dam spillway failure that triggered massive evacuations and an infrastructure breakdown at the heart of its water delivery system in the Delta.

Croyle was prepared, having just stepped out of his position as Deputy Director for Statewide Emergency Preparedness and Security.

DWR's 11th chief of staff only since January 1, Croyle first mobilized the Department to deal with threatened levees and related emergencies from a conveyor belt of atmospheric rivers that turned a relentless hose on the drought-dry state.

As downstream levees were being strained, flood control releases from rapidly filling Lake Oroville scoured out a large hole in

the dam's main spillway. Despite DWR's efforts to investigate erosion while managing reservoir levels, higher-than-predicted storm run-off put lake levels over 901 feet for the first time in its 49-year history, sending water over the lip of the dam's unlined emergency spillway. Water began eroding the hillside below the emergency spillway lip, triggering the evacuation of nearly 200,000 people in Butte, Sutter and Yuba counties.

DWR immediately increased outflow down gated flood control spillway to 100,000 cubic feet per second (cfs) to keep the emergency spillway lip, or weir, from collapsing in a catastrophic flood of water.

As Croyle predicted, the rush of 100,000 cfs of water down the gated spillway scoured out even more of its lower section and dumped its fractured pieces into the waterway below.

DWR was becoming worldwide news as Croyle activated emergency response and recovery teams in Oroville and Sacramento. A full mix of the Department's professionals set up a working tent city near the dam as contractors below the spillways did Herculean work repairing erosion damage and removing concrete and other rubble blocking use of Hyatt Powerplant.

With the spillways compromised and the reservoir level rising, it was essential to get Hyatt back into operation as the principal conduit for releasing water. With one eye on the weather, PG&E crews moved erosion-threatened power lines as contractors continued clearing the clogged Thermalito Diversion Pool which threatened to flood the powerplant.

Hyatt was back on line in early March



Bill Croyle, DWR's Drought Emergency Operations Manager in 2015, represents DWR on the Governor's Interagency Drought Task Force. Above: During the fourth year of drought, Croyle as Deputy Director briefs the media about emergency rock barrier installed in June 2015.

reducing the rain-swollen reservoir by up to 12,900 cubic feet a second.

During this balancing act, Acting Director Croyle was becoming a familiar voice and face to news media audiences around the world as he detailed the multi-agency operations to protect local and downstream communities, determine the cause of the problem and blueprint the long-range return to normal.

"The world is looking at what happened here, how we all interact ..." Croyle said at a February 17 news conference at emergency response headquarters in Oroville.

DWR, the Butte County Sheriff's Office, CAL FIRE, the Governor's Office of Emergency Services, U.S. Army Corps of Engineers, California Department of Fish and Wildlife, contractors, PG&E and others gave the world a working example of unified action with their response to the spillway emergency.

On Saint Patrick's Day, emergency response efforts were tested by resumed use of the damaged flood control spillway.

With the reservoir rising and a mountain of snowpack beginning to melt, DWR began releasing up to 50,000 cubic feet per second down the spillway, constantly monitoring its performance.

With the ongoing Oroville spillway emergency and strained levees and localized flooding in the valley, a third problem sur-

faced at Clifton Court Forebay. The forebay is DWR's reservoir that feeds the pumps that deliver Delta water to farmland and millions of Californians in the San Francisco Bay area, Central Coast, San Joaquin Valley and Southern California.

As with stressed levees and Lake Oroville's spillways, high water flows likely caused the third whammy at Clifton Court Forebay. High-volume flows from the Delta into Clifton Court Forebay eroded a portion of the concrete "apron" that supports the reservoir's intake gates and wing walls.

Unlike Oroville and flooding, however, the forebay situation posed no serious threat. Also, it occurred (mid-February) when south-of-Delta reservoirs were full to help meet farm and city needs. Export needs from the Delta also can be met by cooperative pumping by the federal, Central Valley Project's Jones Pumping Plant. No scheduled deliveries to State Water Project customers were interrupted.

Repair work began the week of February 13.

Reflecting on the events of his first winter in the Director's chair, it would be understandable if Croyle regretted his promotion.

On the other hand, emergencies and emergency planning have earned him his paycheck for years.

In calmer times, Croyle began his State career with the Central Valley Regional

Water Quality Control Board in Sacramento. Croyle was lead engineer on major projects and developed the Board's first information technology program.

Croyle joined DWR in 2007 as Chief of the Flood Operations Branch, overseeing flood emergency preparedness and response programs in coordination with local, State and federal agencies.

Moving from flood to drought emergencies, Croyle was named DWR Drought Manager in December of 2013.

Even after this winter's rains began causing flooding and infrastructure problems, drought still held the Tulare County community of East Porterville and other areas in its grip. As Drought Manager, Croyle led DWR's team in the multi-agency response to the East Porterville emergency, connecting homes with dry wells to the City of Porterville's water system.

Croyle was appointed DWR Deputy Director for Statewide Emergency Preparedness and Security on April 10, 2015. California Natural Resources Agency Secretary John Laird appointed Croyle DWR Acting Director on January 1, 2017.

As a Sacramento State Civil Engineering graduate and in all of his career roles, Croyle has prepared for and ably responded to an impressive variety of engineering and management problems. 💧

An aerial photograph of a spillway. A concrete wall runs diagonally across the frame. To the left of the wall is a grassy area with scattered shrubs. A white car is parked on a dirt path in the upper left. To the right of the wall, there is a rocky area with some water flowing over it. In the upper right, a group of people in orange safety vests are standing near some equipment.

Features

The Spillway

DWR
Employees
Respond to
Oroville Facility
Emergency

By DOUG CARLSON



DWR employees (top right on page 8) assess Lake Oroville's flood control spillway damage on February 7.

It was clear to DWR personnel after only four months of Water Year 2017 that California was experiencing an extraordinary winter.

Precipitation in the Sacramento River and San Joaquin River watersheds by early February had surpassed the rate of rainfall in the wettest year on record, 1982-83. The Sierra Nevada snowpack was well above the April 1 seasonal averages throughout the mountain range.

Lake Oroville, the State Water Project's largest reservoir, had been adding storage since early December with the arrival of significant winter storms. The lake added nearly 800,000 acre-feet (AF) in just four days in early January and another one million AF of inflow beginning on February 6.

In 50 days starting in early January 2017, Lake Oroville received more than 4.4 million AF of inflow, which is equivalent to the long-term 110-year annual average flow on the Feather River. The volume exceeded the previous two-month



As Lake Oroville's level rises above 901 feet on February 11, water flows for the first time over the emergency spillway. Left: DWR Acting Director William Croyle (right) and Acting Deputy Director Mark Andersen (2nd to right) meet with DWR and other agencies staff responding to Oroville incident.

record inflow to Lake Oroville by more than 25 percent.

While this winter was sure to be remembered for its startling contrast with the five preceding years of drought, Oroville Dam spillway became an even bigger reason to remember Water Year 2017.



Helicopters transport rocks in bags to the erosion site at Oroville Dam's emergency spillway on February 13.



At 9:30 a.m. on February 7, an Oroville Field Division employee saw an irregularity in the flow of water released from the reservoir's flood control spillway that was being used to free up space in the lake for runoff from a series of storms hitting Northern California.

Within half an hour, the dam's chief operator informed the Area Control Center that concrete was eroding about one-third of the

way from the bottom of the spillway. Water was crashing into a huge hole in the spillway, causing plumes of water to cascade out of the 180-foot-wide concrete chute and onto adjacent bare ground, taking pieces of concrete with it.

Amateur video of the spectacular display was soon broadcast on television stations across the state. The Oroville Dam spillway suddenly was big news from coast to coast.

DWR activated the Oroville Emergency Action Plan and stopped the spillway's flow to assess damages in its concrete surface. DWR Acting Director William Croyle initiated a series of media briefings that were carried "live" over Sacramento television stations and via Periscope on DWR's Twitter and Facebook pages.

With flows shut off for inspections and intensifying rainfall continuing to increase



runoff into the lake, the level began rising. Operators reopened the gates and ramped up the flow to 20,000 cubic feet per second (cfs) to test the spillway's ability to withstand the pounding of all that water rushing into the cratering hole.

As inflows grew, operators increased the flow down the damaged spillway to 65,000 cfs on February 10. The spillway as originally designed can handle more than 250,000 cfs, although it has historically never released more than 160,000 cfs, the flood-preventing threshold for downstream levees.

DWR and the joint decision-making team were operating the damaged spillway at just enough flow to keep the lake's level below 901 feet elevation above sea level – the spillover height of the dam's emergency spillway, which had never been used since Oroville Dam was completed in 1968. As a contingency, DWR

and California Department of Forestry and Fire Protection crews prepared the hillside by removing trees, brush and debris and grouting selected areas near the crest.

With inflows exceeding forecasted rates by nearly 30 percent within eight hours of the storm's peak, it became evident that the dam's emergency spillway would need to be utilized. On February 11 at 8:00 a.m., the lake's elevation rose above 901 feet, topping the emergency spillway. The level continued to rise and peaked at 902.59 feet at 3 a.m. on February 12.


Water flowing over the emergency spillway found its own path over bare ground down to the diversion pool. By the afternoon of February 12, DWR engineers warned that erosion at the base of the emergency spillway's weir crest could possibly cause the spillway to partially fail.

Crews work 24 hours per day to repair erosion sites on emergency spillway on February 20.

While the integrity of Oroville Dam itself was never threatened, concerns about the emergency spillway erosion prompted public safety officials to order a mandatory evacuation of residents and businesses downstream of the dam. Nearly 200,000 people were affected by the order.

By about 8 p.m., the continuing outflow over the damaged flood control spillway brought the reservoir level below 901 feet, and the emergency spillway ceased flowing. Clear weather allowed outflows to exceed inflows by a ratio of about four to one over the next few days, and the lake's elevation fell below 850 feet by February 21.

Immediately after emergency spillway flows stopped, construction crews began



Oroville Dam's flood control spillway after flows were reduced to zero on February 27 to allow for debris removal and startup of Hyatt Powerplant.



Clockwise above left: Heavy equipment removes the debris in the diversion pool at the base of the damaged Oroville Dam spillway on March 6, 2017. DWR and U.S. Army Corps of Engineers Geologists survey the bottom of Oroville Dam's flood control spillway on February 28. Oroville Dam flood control spillway is assessed for damage on March 3 after spillway shut off for debris removal in diversion pool.





Above: As DWR prepares to use Oroville Dam flood control spillway, a specialized concrete called shotcrete is applied to spillway on March 5. **Left:** DWR and Fish and Wildlife biologists rescue fish in the Feather River on February 28. In a separate activity three weeks later, one million spring-run Chinook salmon were released from the Feather River Fish Hatchery into the Feather River.



Clockwise from above: Governor Edmund G. Brown Jr. and DWR Acting Director Croyle view Oroville spillway damage on February 22. (Right to Left) Croyle (right) with Butte County Sheriff Kory Honea, Congressman Doug LaMalfa and Incident Commander Kevin Lawson of CALFIRE speak at February 13 press conference in Oroville. Croyle greets U.S. Senator Kamala Harris during visit to Oroville spillway on February 23. From left, Matt Murray and Ed Perez of DWR and Oroville Mayor Linda L. Dahlmeier view debris removal on March 4.



More than 1.7 million cubic yards of debris shown when flood control spillway shutoff on February 27. (Below) By April 3, 1.38 million cubic yards of the debris below spillway were removed.

working 24 hours a day, even in inclement weather, to repair erosion on the hillside below the emergency spillway's crest. Concrete was piped into the eroded landscape, and helicopters lifted large bags filled with rocks and sand and placed them to prevent further erosion if the emergency spillway had to be used again.

Debris from both the emergency spillway and flood control spillway piled up in the diversion pool, causing the water elevation to rise between the toe of the spillway chute and the Hyatt Powerplant.

On February 27, with Oroville's lake level lowered to 838 feet, the flood control spillway's flows were reduced from 50,000 cfs to zero to allow removal of debris at the base of the spillway. Crews began removing more than a million cubic yards of debris, and by March 3, the water level in Hyatt Powerplant's tailrace channel had been lowered enough to resume operation of the plant for the first time since February 9. Once fully operational, Hyatt can discharge up to 13,000 cfs of outflows from the reservoir and help manage reservoir storage through the spring and summer to meet all beneficial uses of water released from Lake Oroville.

Approximately 800 DWR employees responded to the Oroville spillways emergency from divisions throughout the Department.

DWR, the California Department of Forestry and Fire Protection and the Butte County Sheriff led the Oroville Spillway's incident command. Through partnerships with the Department of Fish and Wildlife and the federal government, DWR is making efforts to preserve and protect fish populations downstream while construction is happening. One million spring-run Chinook salmon were released into the Feather River on Monday, March 20. Another million were tagged and released in April.

Winter still had several more weeks of potentially wet weather ahead as DWR News went to press. No matter what lay ahead, Water Year 2017 already had created enough memories for DWR personnel to last a lifetime. 💧



COMING HOME

New Research Vessel Arrives in Antioch

By CHRISTINA
JIMENEZ





For the second time in DWR history, the Division of Environmental Services' (DES) Environmental Monitoring Program (EMP) welcomed - The Sentinel - a new, custom-built 60-foot research vessel with the latest scientific technologies at the close of 2016.

"The vessel is how the EMP will navigate the Bay-Delta to gather water quality, phytoplankton, zooplankton, benthos and harmful algal bloom data that we use to analyze and understand the estuarine ecology," said Environmental Program Manager Karen Gehrts, Chief of the DES Environmental Water Quality and Estuarine Studies Branch.

"It is mission critical, and ensures we comply with Water Right Decision 1641 and Biological Opinion requirements."

With a crew of five to eight on board each monitoring trip, the EMP research vessel spends about 10 to 15 days on research missions each month.

"When I first joined DWR in 2000, I had the opportunity to work on the Division's first research vessel, The San Carlos and with its first Captain, Lloyd Brenn," said Gehrts. "Lloyd would share stories of being part of the team that originally designed and constructed the vessel and would describe how he traveled with the boat from Newport, California - where it was built - into San Francisco Bay. Now, 40 years later, it's happening again."

Named after the first ship to enter the San Francisco Bay in 1775, DWR's San Carlos arrived in 1976. The San Carlos that was decommissioned in January 2017 has served as the EMP's primary research vessel.

The Sentinel, built by contractor Vigor in Seattle, Washington, replaces The San Carlos. DWR research vessel operators Eric Santos and Nick van Ark were on board during the Sentinel's eight-day voyage to California which began on November 30.

The Sentinel was commissioned in Old Sacramento on December 19. DWR Director Mark W. Cowin, who retired in December, dedicated the vessel in honor of the late Laura King Moon, DWR's former Chief Deputy Director who passed away in 2015.

"Laura King Moon worked tirelessly as a guardian of California's water supply and its environment," Cowin said. "This new research vessel is dedicated in her memory." Moon was an environmental champion who dedicated her 38-year career to resource and water policy.

Designed with Intent

"To be a part of the team charged with designing the boat specifications needed to conduct the research required is definitely a once-in-a-lifetime opportunity," van Ark said.

The EMP team began working in 2009 with marine architects, vessel engineers and partner agencies, including the National Oceanic and Atmospheric Administration, to analyze desired vessel specifications for The Sentinel and ensure it meets the Department's needs.

"When designing the plans for the new boat, we also spent a great amount of time examining The San Carlos specifications – what works and what does not," said Gehrts. "We took a lessons-learned approach and applied it to the new boat."

Designs for the 36-ton vessel focused on two key priorities: operational needs and scientific requirements.

"In terms of operating features, we needed a vessel that had enough space to comfortably fit our staff and equipment," said van Ark.



The Sentinel

Length: 60 feet

Beam: 24 feet

Draft: 3 feet 6 inches

Weight: 36 tons

Engines: Twin Cummins QSB 6.7 conventional propulsion generating 419 HP

Max Speed: 22 knots

Aft deck work area: 337 square feet

Three 3,300-pound-capacity cranes, one with direct connection to the Lab

Lab Area: 266 square feet

9-foot work skiff with 30 HP motor

Overnight accommodations for five people • Meets U.S. Coast Guard's safety regulations for passenger vessels
• Air Conditioned • Lab raw water manifold for scientific instrumentation
• 30 Local Area Network (LAN) connections • 4G wireless

Estimated cost \$3.62 million

In the past, with larger studies requiring larger sampling quantities, DWR has requested U.S. Bureau of Reclamation's vessel to accommodate the additional materials needed on board.

The Sentinel has 337-square-feet of deck space designated for field sampling and equipment, including a hydraulic crane.

"From a scientific perspective, The Sentinel is designed to be able to incorporate everything the boat needs to be a platform for current and future research," said van Ark.

A 266-square-foot laboratory will house water quality filtering systems, scientific instrumentation and computers for the sampling staff.

"We've designed the lab to be as sophisticated as possible," said EMP's Senior Environmental Scientist Supervisor Shaun Philippart. "The Sentinel will have the latest and greatest technology on board."

More Proficient

A new flow-through system on board will ensure data collected is more reflective of current conditions.

"We gather water quality and GPS data every three seconds while the boat is underway," Philippart said. "We also take a vertical profile at each site using a YSI sonde. The design of the flow-through system will improve the accuracy and precision of the data that we collect."

Speed is another major feature of The Sentinel. "The San Carlos topped out at 10 knots," said Philippart. "It took up to three hours to get from its home in Antioch to San Pablo Bay where we have monitoring stations. The Sentinel speed tops out at 22 knots – more than twice as fast."

"The new boat is adaptable and expected to meet the needs of the Department for many years to come – an expected 30 years," said Gehrts. "It complies with the U.S. Coast Guard's most stringent safety regulations, meets all of the latest construction and engineering safety standards and is equipped with the best and most modern safety and navigation equipment."

Agencies Unite

The Sentinel will be a resource to the Interagency Ecological Program (IEP), a team of nine State and federal agencies – including DWR.

Established in the 1970's, the IEP team supports the agencies' exploration and stud-

ies of Bay-Delta, State Water Project and Central Valley Project water.

“The San Carlos had been down a lot in the past seven years, and the United States Bureau of Reclamation – also part of the IEP – stepped in and lent us a captain and vessel similar to The San Carlos. We relied heavily on them to ensure our work got done,” said vanArk.

The Sentinel also will provide backup

capabilities for the IEP if another agency’s vessel breaks down.

“As part of the IEP team, we cooperatively work together to ensure Biological Opinion requirements and water right decision mandates for the Bay-Delta are met,” said Gehrts. “It is our duty to help our IEP team members when they need support with monitoring, which includes lending a captain and boat.” 💧

Clockwise from above: Eric Santos, DWR Research Vessel Operator, shows Sentinel’s features during commissioning event on December 19, 2016 in Old Sacramento. DWR Director Cowin, who retired in 2017, speaks at event. The vessel was named in honor of the late Laura King Moon, DWR’s former Chief Deputy Director. DWR Research Vessel Operator Nick van Ark (right) reviews engine room operations with contractor. The Sentinel, constructed in Seattle, arrives in San Francisco on December 7, 2016.



Will Next Winter Be Wet or Dry?

Improving Long-Range Precipitation Forecasting

BY JEANINE JONES, INTERSTATE RESOURCES MANAGER

Lead time is critical in making water management decisions. Improving precipitation forecasting for weeks to months ahead (long-range weather forecasting, also called sub-seasonal to seasonal forecasting) would provide longer lead times than are now available.

The National Weather Service's operational weather models are run out to 16 days, but quantitative forecasts of precipitation are only made out to six days. Unfortunately the skill of longer-term outlooks and fore-

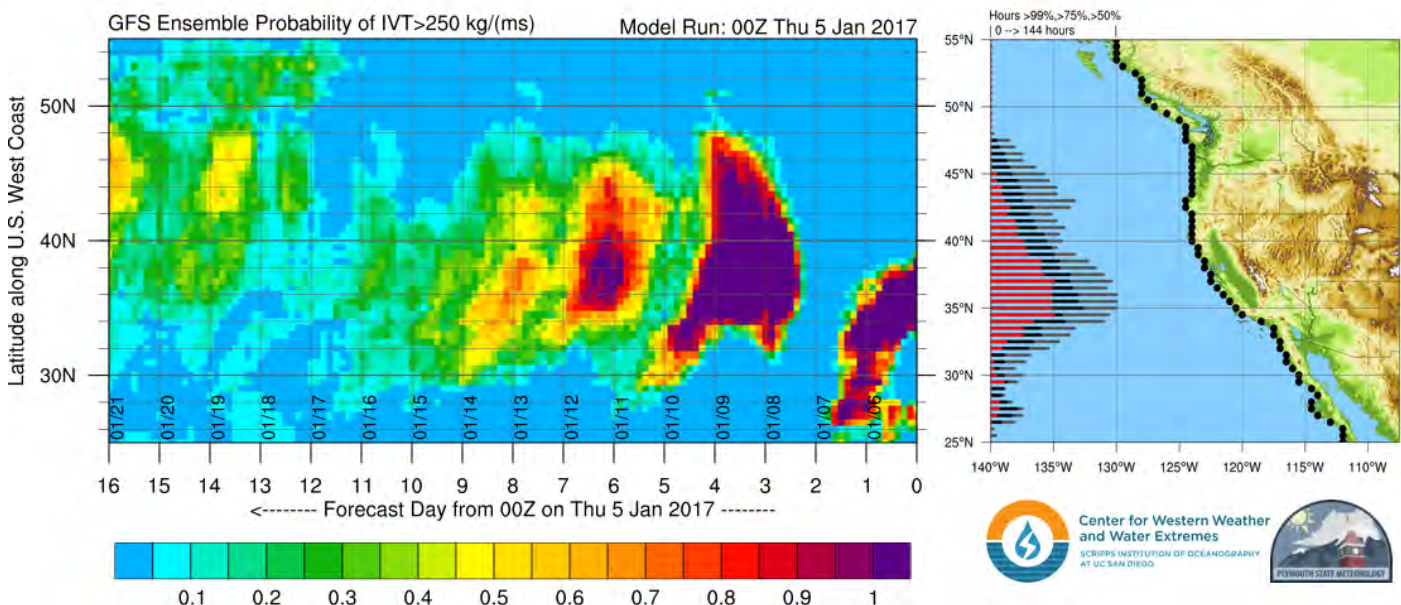
casts, such as those prepared by the National Oceanic and Atmospheric Administration's (NOAA's) Climate Prediction Center (CPC), is not presently adequate to support water management decision-making.

Water managers in California work in a challenging location, one that experiences the greatest variability in annual precipitation of anywhere in the country and where conditions can quickly shift from drought to flood. Better skill in long-range precipitation

forecasting would improve the ability to efficiently manage water supplies and uses, and to operate infrastructure for water supply and flood risk reduction purposes.

Moreover, most of California's largest reservoirs were designed to be operated based on the hydrology of the first part of the 20th century, with reservoirs being drawn down during the wet season to provide room for floodwaters and then allowed to fill with spring snowmelt runoff. As a warming cli-

This Scripps experimental forecast shows the probability of an atmospheric river storm reaching the West Coast at a weather model timescale. Almost all of the forecast skill is in the first week of the prediction period.



... there are multiple opportunities for improving prediction skill, including better understanding of the El Niño-Southern Oscillation, the Madden-Julian Oscillation, the Arctic Oscillation and land-atmosphere interactions and feedbacks.

mate results in more precipitation falling as rain rather than as snow, more efficient operation of existing infrastructure will be required as part of climate change adaptation.

Improving long-range precipitation forecasting will require a multi-pronged research strategy and involves incremental advances that will occur over decades.

Two National Academy of Sciences reports – one in 2010 and another in 2016 – identified a path forward, finding that

there are multiple opportunities for improving prediction skill, including better understanding of the El Niño-Southern Oscillation, the Madden-Julian Oscillation, the Arctic Oscillation and land-atmosphere interactions and feedbacks. This information would be used to improve weather and climate models that simulate atmospheric dynamics at global scales to develop forecasts at smaller spatial scales, such as NOAA's outlooks for the United States. DWR is working with the Western States Water Council and NOAA to identify priorities for advancing this effort.

While the process of improving global-scale models occurs, there are opportunities to explore

other approaches that may provide skill improvement at the regional scale of the western United States.

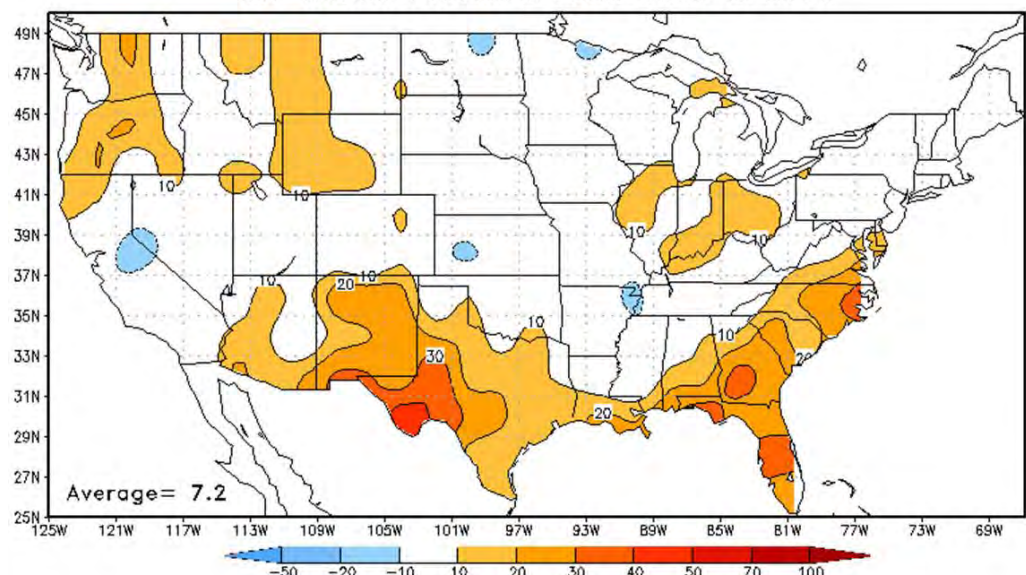
One promising direction is to understand predictability of phenomena that are large contributors to annual water supplies, such as atmospheric river storms in California or the monsoon in the southwestern U.S. DWR and the Center for Western

Weather and Water Extremes at the Scripps Institution of Oceanography are collaborating to explore development of atmospheric river storm forecasts.

Experience developed through that process in combination with other research could build capacity for making experimental forecasts that could add predictive skill at longer lead times. 💧

This NOAA CPC graphic shows the historical skill of seasonal precipitation forecasts during the wet months of December, January and February. A score of zero (represented by the white area covering most of the map) means that the forecast had no more skill than simply using historical average conditions. A perfect score of 100 would mean that the forecast replicated observed precipitation.

Seasonal (Lead 0.5 Months) Precipitation Heidke Skill Score
DJF Manual Forecasts From 1995 to 2016



AQPI | 4 BA

Better Monitoring and Prediction for Integrated Water Management in the Bay Area

BY MICHAEL ANDERSON, PH.D., P.E., STATE CLIMATOLOGIST

A new project is underway in the Bay Area to bring state-of-the-art technology to integrated water resources management. AQPI – Advanced Quantitative Precipitation Information – is a multi-faceted project of improved monitoring, prediction and decision support for the benefit of flood management, emergency response, water quality, ecosystem services, water supply and transportation management for nine Bay Area Counties.

AQPI is a four-year effort funded in part by a \$19.8 million grant from DWR's Integrated Regional Water Management Program using funds from Proposition 84. It is a fantastic

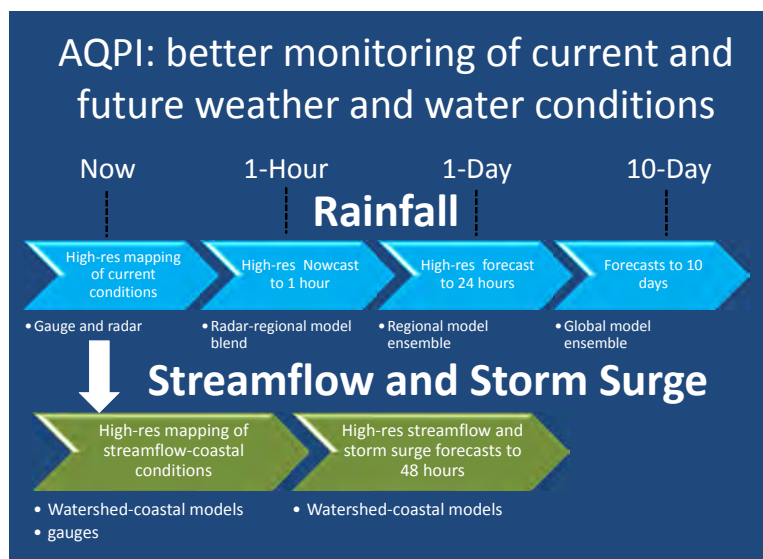
collaboration of federal, State and local governments with assistance from the research community. The Sonoma County Water Agency has agreed to take on coordination of the award as the local sponsor. Other local participants include the San Francisco Public Utilities Commission, Santa Clara Valley Water District and the Bay Area Flood Protection Agencies Association.

The Bay Area faces a multitude of threats from extreme precipitation events, including disrupted transportation from flooded roads and railroad lines, water management challenges related to stormwater, river and res-

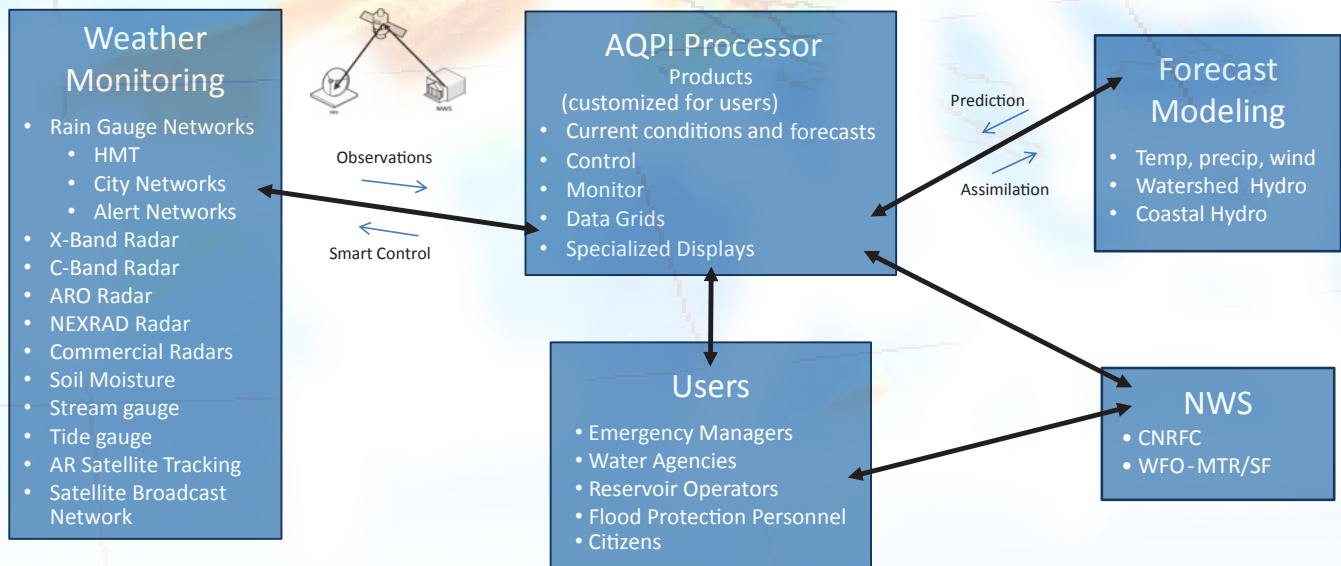
ervoir management and storm-related damage demanding emergency response. These threats occur on spatial scales ranging from local communities to the entire region and time scales ranging from hours to days. The premise of AQPI is that improved monitoring of conditions combined with enhanced forecast and decision support systems can

enable local responders and water managers to meet the challenges of emergency response and integrated water management with greater success. Recent research has focused on the role of atmospheric rivers (ARs) in extreme precipitation events. The study of the structure, evolution and timing of ARs and their relation to the timing, location and magnitude of extreme precipitation has yielded knowledge that is ready for use by the water management community. AQPI is a cutting-edge project to apply this new knowledge for the benefit of integrated water management in the Bay Area.

AQPI's foundation is advanced observations. Building off of the State's Extreme Precipitation Monitoring Network (a collaborative project with NOAA's Earth Systems Research Laboratory, Scripps Institution of Oceanography and DWR that started in 2006), AQPI will add a collection of a C-band and four X-band scanning weather radars and other sensors to improve the observation of precipitation offshore and precipitation and runoff across the complex topography of the Bay Area. The enhanced observations will be input for new forecast products and new decision support tools for use by the water resources management and emergency response community in the Bay Area.



AQPI System



The new, more detailed precipitation forecasts, streamflow forecasts and storm surge forecasts will provide advanced information and specific decision support tools especially critical to improved emergency response and storm-water management, and should also benefit river and reservoir management. Primary benefits from the investments include:

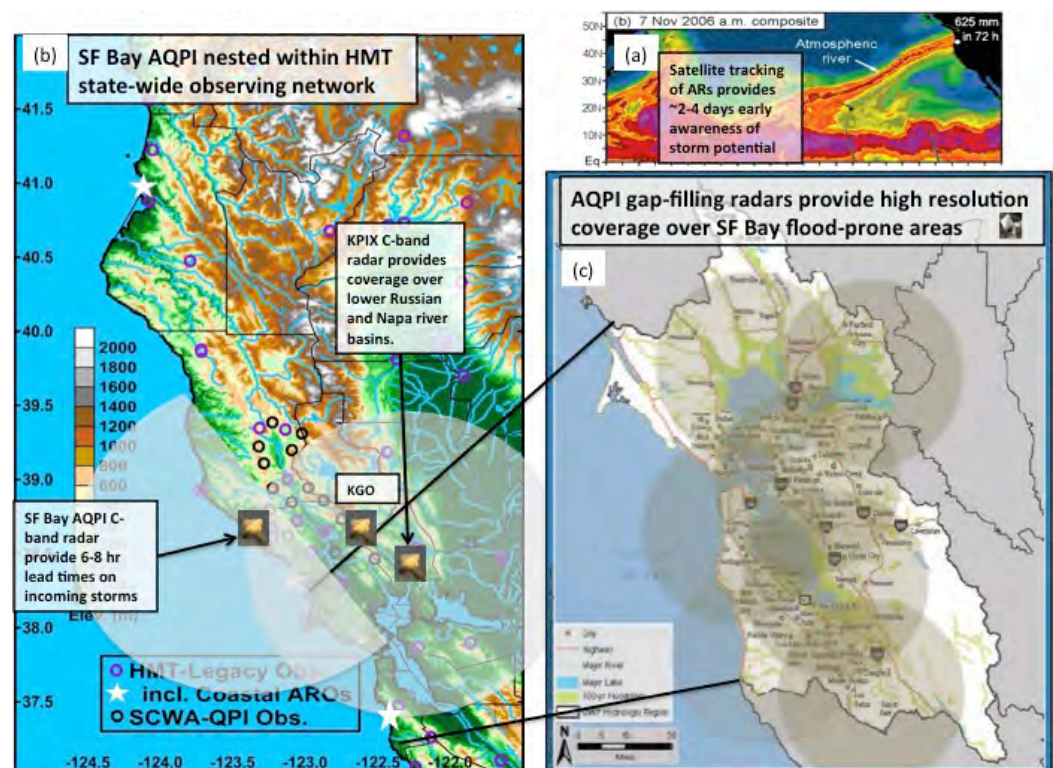
- avoided flood damage costs
- minimization of water quality impacts from stormwater and combined sewer operations
- enhancement of public safety for the multitude of transportation modes in the region

The improved forecasting system also has potential to contribute to improved reservoir storage and river flow management for water supply and ecosystem services.

As the 21st century marches forward in a changing climate with increased demands to manage water across a complex tapestry of space and time scales and management objectives, new tools and approaches will be needed. AQPI is helping the Bay Area meet the challenge in a collaborative and innovative way. 💧

The study of the structure, evolution and timing of ARs and their relation to the timing, location and magnitude of extreme precipitation has yielded knowledge that is ready for use by the water management community.

Conceptual layout of monitoring instrumentation augmentation across the Bay Area region.



Making Sure Levees Do What They are Designed to Do

BY CAIT PLANTARIC, FLOOD MANAGEMENT

Following the February flood of 1940, which included 40 levee breaks and the inundation of 1,000 square miles of the Sacramento Valley, then-governor Culbert Olson declared, “In addition to the necessity of planning and constructing adequate works for flood control, it is essential that provision be made for the proper management, operation and maintenance of flood control works [levees] which now exist or may hereafter be constructed.”

Governor Olson noted that levee failures during the 1937, 1938 and 1940 floods were due, in large part, to inadequate levee maintenance. Shasta Dam, the first large dam in the Sacramento River Watershed, would not be completed until 1945, so Sacramento Valley residents depended on a levee and bypass system for flood protection. Thus, levee maintenance was critical.

Today, Californians in the Central Valley depend on several reservoirs and the State

Plan of Flood Control (SPFC) for flood protection. At 1,600 miles long, the levee system remains the largest element of the SPFC. Fortunately, levee construction and maintenance methods have improved greatly since the mid-20th century.

However, one thing has not changed: levees that are not adequately maintained have an increased risk of failure, especially if they have defects, such as sandy embankment material or defective foundations.

DWR is responsible for operating and maintaining nearly 300 miles of the 1,600 miles of SPFC levees while local agencies are responsible for maintaining the rest. Because erosion, rodent and beaver burrows weaken levees and substantially increase the risk of failure, key maintenance activities include repairing erosion damage and grouting rodent holes/burrows which provide pathways for floodwater through levees.

“When levees aren’t adequately main-

tained, they can’t do what they’re designed to do, and that’s not good for anyone,” said Joel Farias, Superintendent of DWR’s Sutter Maintenance Yard.

“Levees are more likely to sustain damage during long periods of holding back water,” said Michael Mierzwa, Chief of the Division of Flood Management’s Planning Office. “Additionally, floods can easily carry along trees and other heavy objects that damage levees. When floodwaters recede, bringing eroded and damaged levees back to their pre-flood capability is critically important for protecting communities and infrastructure,” said Mierzwa. “This maintenance has to be done before the next flood as a matter of public safety, as well as for protecting California’s habitat resources and economy.”

Flooding in February, 1940 caused approximately one billion dollars (2015 dollars) in damages in the counties adjacent to the Sacramento River. Today, the Sacramento Valley has more at risk of flooding than at any time in its history. Today, the agricultural production value alone of these nine counties – home to more than 2.7 million people -- is approximately \$5.3 billion (2014).

To protect all of this, we depend to a large extent on levees. 💧

Winship School, south of Meridian on March 1st, 1940



How Do You Build a Flood Plan?

By NIKKI BLOMQUIST, FLOOD MANAGEMENT

Ever wonder what it takes to create a strategic plan to improve flood risk management in the Central Valley during one of California's longest droughts? It takes engagement - lots of it.

Work to update the Central Valley Flood Protection Plan (CVFPP) began after the Central Valley Flood Protection Board (CVFPB) approved the historic flood plan in June 2012. Partner engagement was critical in developing the 2012 CVFPP, but DWR recognized a need to work even more closely with local agencies and stakeholders to refine the plan. Since then, hundreds of hours of meetings, workshops and technical discussions with non-governmental organizations, agricultural interests, elected officials, landowners, tribal governments and local, State and federal agencies have helped shape the Draft 2017 CVFPP Update. This update refines the State's strategy about investing in flood risk management projects throughout the Sacramento and San Joaquin River basins that make up the Central Valley. The plan was released for public review in December.

DWR and CVFPB launched a regional effort to help local flood management agencies, land use agencies, flood emergency responders, environmental and agricultural interests, and other interested parties create comprehensive regional flood management plans that describe local flood management priorities, challenges, potential funding mechanisms and site-specific improvements.

"The Regional Flood Management Planning process has been an unprecedented success at bringing local, State and federal stakeholders together to work through the issues and develop feasible flood risk management solutions," said Christopher Williams, Senior Engineer with DWR's Flood Planning Office.

The effort has also helped strengthen regional governance and foster a shared vision for local and regional flood protection.

Input from our partners proved particularly important for the development of documents to support the 2017 CVFPP Update. Discussions about the Draft Sacramento River and San Joaquin River Basin-wide Feasibility Study formulations and results ultimately led to recommendations about potential multi-benefit projects in the two river basins.

DWR's goal has been to provide stakeholders with opportunities, in a variety of venues, to participate in the overall CVFPP planning process and to improve positive, productive working relationships. DWR provided monthly updates to the CVFPB and Coordinating Committee, incorporating feedback into the Draft 2017 CVFPP Update.

Ongoing discussions with stakeholders continue to yield important insights about flood management needs, challenges and opportunities across the Central Valley. Many of these issues are reflected in the Draft 2017 CVFPP Update; others will continue to be discussed among stakeholders and policymakers as the CVFPP is implemented and refined in future flood planning updates and regional coordination.

Reflecting on his experience leading this intensive planning process, Michael Mierzwa, Chief of the Flood Planning Office, said "When it comes to a transparent planning process there is no such thing as too many meetings with stakeholders."

"The conversations at these meetings have not only helped shape the strategies included in the Draft 2017 CVFPP Update, they have offered agencies and organizations a forum to have conversations that will ultimately help integrate flood management planning," Mierzwa said.

The Draft 2017 Update will go through an extensive public comment and hearing process early this year led by the CVFPB. DWR staff will use these comments to refine the plan before it goes to the CVFPB for adoption, which is planned for late June. 💧

Website: <http://www.water.ca.gov/cvfmp/>

Measuring Engagement

Presentations to Central Valley Flood Protection Board (CVFPB)

31

Presentations to Coordinating Committee and CVFPB Advisory Committee

23

Meetings to gather technical input on CVFPP supporting documents

33

Meetings to inform development of Regional Flood Management Plans and Actions

67

Public workshops, open houses and webinars

13

Meetings with state and federal agency staff

80

Additional small group, individual stakeholder, and tribal meetings and briefings on CVFPP topics

130+

Floodplain Risk Management Partnerships

BY MARIA LORENZO-LEE,
FLOOD MANAGEMENT

DWR strengthened floodplain risk management partnerships in 2016 with the Floodplain Management Association (FMA) Conference and California Silver Jackets Charter signing.

The annual FMA conference features both formal presentations and informal discussions. The formal presentations and technical sessions allow local, State and federal agency staff to learn from their peers and present original research and best practices in different areas of floodplain management. One session showcased regional flood improvement projects from five nearby agencies, which highlighted the variety of improvement alternatives from new levee construction to seepage cutoff wall installation to streambank

erosion control. Informal discussions allow attendees to ask questions and better understand complex policy issues.

With some 650 experts from across the nation and worldwide in attendance, the 2016 FMA conference provided an excellent opportunity for participants to discuss the most challenging topics facing floodplain managers. Topics included sustaining agriculture in floodplains and balancing the risk associated with development in floodplains and economic growth for communities.

Addressing California's unique flood challenges requires strong local, State and federal partnerships. The annual FMA conference helps foster those partnerships as does the ongoing work of California's Silver Jackets team. Silver Jackets is a U.S. Army Corps of Engineers (USACE)-facilitated and State-led effort to reduce flood risk through 12-18 month non-structural interagency projects. During the last day of the 2016 FMA conference, the California Silver Jackets Charter was signed by about 15 local, State and federal agencies. Signatories included DWR, USACE and National Oceanic and Atmospheric Administration. The charter provides for improved cooperation and coordination on non-structural interagency projects, such as

the recently approved proposal for developing a California post-wildfire information resource guide and website.

"Silver Jackets leads participating agencies toward innovation in handling flood risk management, residual risk and emergency management," said DWR Deputy Director Gary Bardini at the signing ceremony. "Ultimately, Silver Jackets will continue the capacity-building that DWR and other partner agencies have been engaged in for the past few years."

One of Silver Jackets' key projects is "Watershed University." It is a free, annual two-day workshop that provides education and networking opportunities for California professionals in floodplain management, water management and emergency response management. This workshop is a cooperative effort led by the [California Silver Jackets](http://www.floodplain.org).

FMA represents the California, Nevada and Hawaii areas, and focuses on educational outreach to attendees. For more information, visit www.floodplain.org.

For California Silver Jackets information, visit <http://silverjackets.nfrmp.us/State-Teams/California>; For Watershed University information, visit <http://water.ca.gov/floodmgmt/watershed-university/>

DWR Deputy Director Gary Bardini (fourth from right), California Silver Jackets lead Mary Jimenez (front row, left) and other charter signatories at signing of California Silver Jackets Charter.





A Tool for Enhancing Water Conservation and Learning

DWR installs six California Irrigation Management Information System Stations in 2016 BY AKIELA MOSES

DWR's new California Irrigation Management Information System (CIMIS) station at Beattie Middle School in San Bernardino County – one of six installed in 2016 -- collects weather data used by farmers, irrigation managers and students.

"This CIMIS station is one of many throughout the state that assist farmers and water agencies in their water conservation efforts," said DWR's Michael Sabbaghian, Southern Region Office Chief, at the October ribbon-cutting ceremony at Beattie Middle School. "In this case, it also benefits students as a tool for learning about the science of climatology, water conservation and irrigation management."

When the CIMIS Program was created by DWR and the University of California, Davis in 1982, there were 17 stations. It was originally intended to aid farmers in efficient irrigation scheduling and water conservation following the drought of the 1970s.

Today, CIMIS automated weather stations

are relied on by numerous agencies, farmers, consultants and researchers for hourly data to calculate water use information. CIMIS provides readings on reference evapotranspiration (ET_o), rainfall, air temperature, humidity, wind speed and solar radiation, among other data. CIMIS data can be used to schedule irrigation systems, estimate chilling hours and growing degree days, manage pests, monitor air quality, generate energy, fight fires and forecast weather.

The number of automated stations has increased to 153 with the installation of six in 2016 and nine in 2015.

CIMIS stations are maintained by local cooperators with assistance from DWR's four Region Offices. DWR downloads the stations' data on solar radiation, wind speed, air temperature and relative humidity to calculate ET_o and disseminates results on the CIMIS website below. ET_o focuses on the amount of water that evaporates and transpires from a standardized grass surface where CIMIS station stands.

"Irrigators should apply only the amount of water their plants need," said Bekele Temesgen, CIMIS Program Chief. "CIMIS will help them figure out how much water to apply and when to apply it."

State and local environmental agencies are not the only groups that benefit from the use of the CIMIS Program's weather stations. Firefighters have used the weather stations to identify wind speed and direction while fighting wildfires. Since the program began, the number of registered weather station data users has increased from 100 to more than 50,000.

"From the mountains to the beaches of Southern California, CIMIS stations can be found at Lake Arrowhead, Big Bear Mountain, Otay's Olympic Training Center and Torrey

Sergio Fierro (right) shows new CIMIS station at Beattie Middle School to Michael Sabbaghian. Above: CIMIS stations are found throughout California.



CIMIS FACTS

153 active stations throughout California

Southern Region Office area has
62 stations

South Central Region Office has
42 stations

North Central Region Office has **38** stations

Northern Region Office has **11** stations

There are more than **50,000**
users of the CIMIS website

The **oldest** CIMIS Program station,
installed on June 7, 1982,
is located at Five Points in Fresno

Pines Golf Course," said Sergio Fierro, Chief of the Water Conservation and Land and Water Use Section in the Southern Region Office. His staff oversees 62 stations from Inyo to San Diego counties and California's border with Arizona to the Pacific Ocean.

"As we strive to mitigate the impacts of the unprecedented drought on our state, it is essential that we provide water conservation tools such as CIMIS to the public in a timely manner," said Temesgen.

Weather station data is reported on the CIMIS website and is available at no cost to the public. 💧

For more information, visit www.cimis.water.ca.gov

Helping Grow Grapes

By DOUG CARLSON

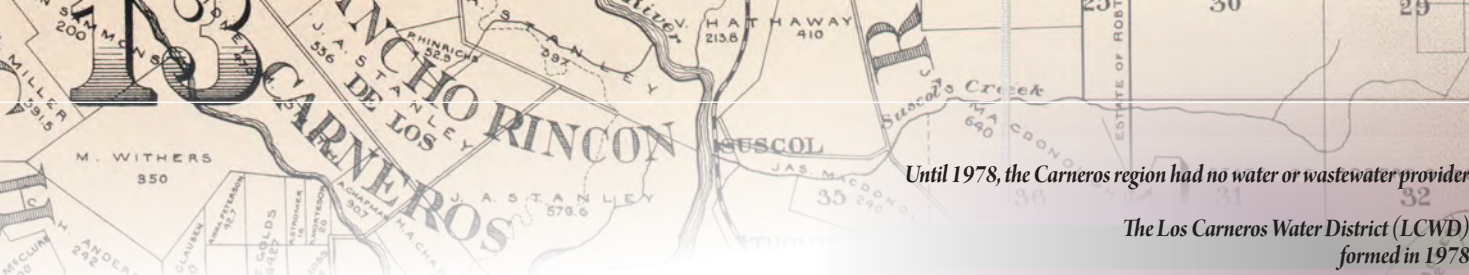
PHOTOS BY
CAROLLO ENGINEERS

Contractor installs purple pipe for providing recycled water to Napa vineyards.

Integrated Regional Water Management Grant Provides Recycled Water for Wine

What would you call turning recycled irrigation water into wine? Wouldn't that be sustainable ingenuity in action – and somewhat of a miracle, too?

It's happening today in Napa Valley thanks to collaboration among water users, and State and federal agencies that provided funding and the contribution of thousands of volunteer hours by people who grow grapes in the heartland of California's wine industry.



Until 1978, the Carneros region had no water or wastewater provider.

The Los Carneros Water District (LCWD) formed in 1978

If you've ever driven California Highway 12 to the coast from the Sacramento Valley, you've passed through the Carneros grape-growing appellation, a beautiful region of gently rolling hills covered with trellised rows of vines.

Picturesque though it is, the Carneros region at the southern end of Napa Valley has a water supply problem.

Water scarcity is bad business if you grow grapes, especially with virtually no groundwater available for irrigation. The soil is heavy with clay, and rain tends to run off rather than sink into the ground.

Until 1978, the Carneros region had no water or wastewater provider. The Los Carneros Water District (LCWD) was formed in 1978 as an all-volunteer operation with a single purpose – to provide recycled water service to the Carneros community and its 4,122 acres of vines and residential irrigation.

After years of volunteer efforts to move the project forward, the District sponsored a Recycled Water Feasibility Study in 2010 that eventually led to a series of Assessment District votes to fund the \$16 million Los Carneros Recycled Water Pipeline Project. It was approved by a 3-to-1 margin.

LCWD also worked closely with the San Francisco Bay Area Integrated Regional Water Management Region to include the Project in DWR's Proposition 84 IRWM 2014 Drought Grant Program application.

The San Francisco Bay Area was awarded \$32.2 million in grant funds, including \$2 million for the Los Carneros project. In total, State and federal grants made up 45 percent of the project's cost. Construction began in 2015, and recycled water started flowing into vineyards in August of last year.

John Stewart, LCWD President, said LCWD's recycled water is pumped through an 8.6-mile distribution system from the Napa Sanitation District after ter-

tiary treatment, which he called the "gold standard" of wastewater treatment. "This water is probably better quality than some of the groundwater that's used in the area," he said. The distribution system is entirely gravity fed and therefore avoided the cost of building and operating pump stations.

Irrigating thousands of acres of California's premium vineyards with recycled water might have presented a marketing problem at one time, but that stigma evaporated years ago, according to Jim Lincoln, who leads LCWD's Outreach Committee. Lincoln's family has been growing grapes in Napa Valley for five generations, and he now manages some of the Beckstoffer Vineyard acreage.

Lincoln said recycled water supplies about 40 percent of his water use. "It's all positive," he said, "because those of us using recycled water are drawing less from creeks and streams. In the years before the project, we barely got by when it didn't rain. Now it's all good -- a success story all the way around."

Zaffar Eusuff, Program Manager in DWR's Financial Assistance Branch, said the LCWD project is offsetting more than 1,200 acre-feet of potable water demand annually. "The community's eagerness to connect their parcels to the new recycled water pipeline demonstrates the importance of this project to an area experiencing extreme drought conditions," Eusuff said.

California's five-year drought has made believers out of grape growers elsewhere. "People are envious," Lincoln said. "They come to see where their reserve-quality Chardonnay grapes are thriving on recycled water." 💧



DWR Engineer Mehdi Mizani of IRWM views a Napa connection that fills a holding detention basin used to irrigate a vineyard.



LCWD sponsors a Recycled Water Feasibility Study in 2010

A series of Assessment District votes to fund Los Carneros Recycled Water Pipeline Project.

LCWD Recycled Water Pipeline Project included in DWR's Proposition 84 IRWM 2014 Drought Grant Program application.

Project construction begins 2015

Recycled water flowing into vineyards in August of 2016

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Clean, Drain and Dry

Quagga Mussel Discovery Leads to Boating Restrictions at Pyramid and Castaic Lakes

With the discovery in December of 16 quagga mussels in State Water Project facilities in Los Angeles County, boating restrictions expanded to prevent their spread.

DWR inspections on December 8 and 13 found 16 adult quagga mussels in the Angeles Tunnel, which was de-watered for a 10-year maintenance inspection. The Angeles Tunnel conveys water from Pyramid Lake through the Castaic Powerplant. Water flows to the Elderberry Forebay, which is connected to Castaic Lake. Two adult quagga mussels were discovered at the Castaic Powerplant on December 15.

California Department of Fish and Wildlife (CDFW) determined that Pyramid Lake and Elderberry Forebay is infested with quagga mussels, and both Castaic Lake and Castaic Lagoon are presumed infested. No evidence of mussel reproduction or larval or “veliger” stage mussels has been found in Castaic Lake or Lagoon during DWR’s monthly monitoring.

Boats undergo inspection as they arrive and leave Pyramid and Castaic lakes and Castaic’s Lower Lake Lagoon. The Los Angeles County Parks and Recreation Department conducts inspections to ensure that all water is drained from boats, including outboards, bilges and livewells, which are tanks installed on many boats to keep caught fish alive. “Clean boat” tags are no longer given to boats leaving Pyramid and Castaic lakes due to potential mussel contamination there. Currently, boats are marked with a special tag honored only at that particular lake. Because the mussel invasion is an emerging situation, please contact LA County Parks for the latest information regarding boat inspection

requirements at Pyramid and Castaic lakes.

Castaic and Pyramid lakes are managed by DWR, while Castaic Powerplant and Elderberry Forebay are managed by the Los Angeles Department of Water and Power.

The quagga mussel is an ecological threat to California’s native species and can colonize hard surfaces, clogging water intakes, screens and pipes. A small freshwater mollusk indigenous to Ukraine, the quagga mussel was first discovered in North America in 1989 and then west of the Continental Divide at Lake Mead in 2007.

CDFW is allowing bass fishing tournaments in Castaic and Pyramid lakes. To obtain tournament permits, a permittee must abide by special conditions, including boat inspections before entering bodies of water.

To prevent the spread of mussels, boats should be cleaned, drained and dried. 💧

Protect your boat from mussels by viewing the Boat Cleaning Guide at <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=4957>

First six mussels found in the Angeles Tunnel.



People

Francis Chung Appointed Bay-Delta Office Chief

Calendar year 2017 kicked off with new responsibilities for Dr. Francis Chung, appointed as Chief of DWR's Bay-Delta Office (BDO) in December, 2016.

Chung, who joined DWR in 1980, has a Doctorate in Civil Engineering from the University of California, Davis and brings 40 years of modeling expertise to his new appointment.

Previously serving as Chief of Bay-Delta's Modeling Support Branch, Chung was responsible for overseeing the implementation of computer models for the Central Valley Project and State Water Project. He has worked on a wide range of mathematical models dealing with water engineering, including surface and groundwater hydrology, upper watershed hydrology, demand estimation, evapotranspiration, land use, reservoir operations, systems engineering, optimization, estuarine hydrodynamics and water quality.

As Chief of BDO, Chung will be at the head of DWR programs to protect and improve the water quality, ecosystem and water supply reliability of the Sacramento-San Joaquin Delta. The BDO also generates and maintains computer simulation models that analyze the effects of projects initiated by DWR and other agencies.

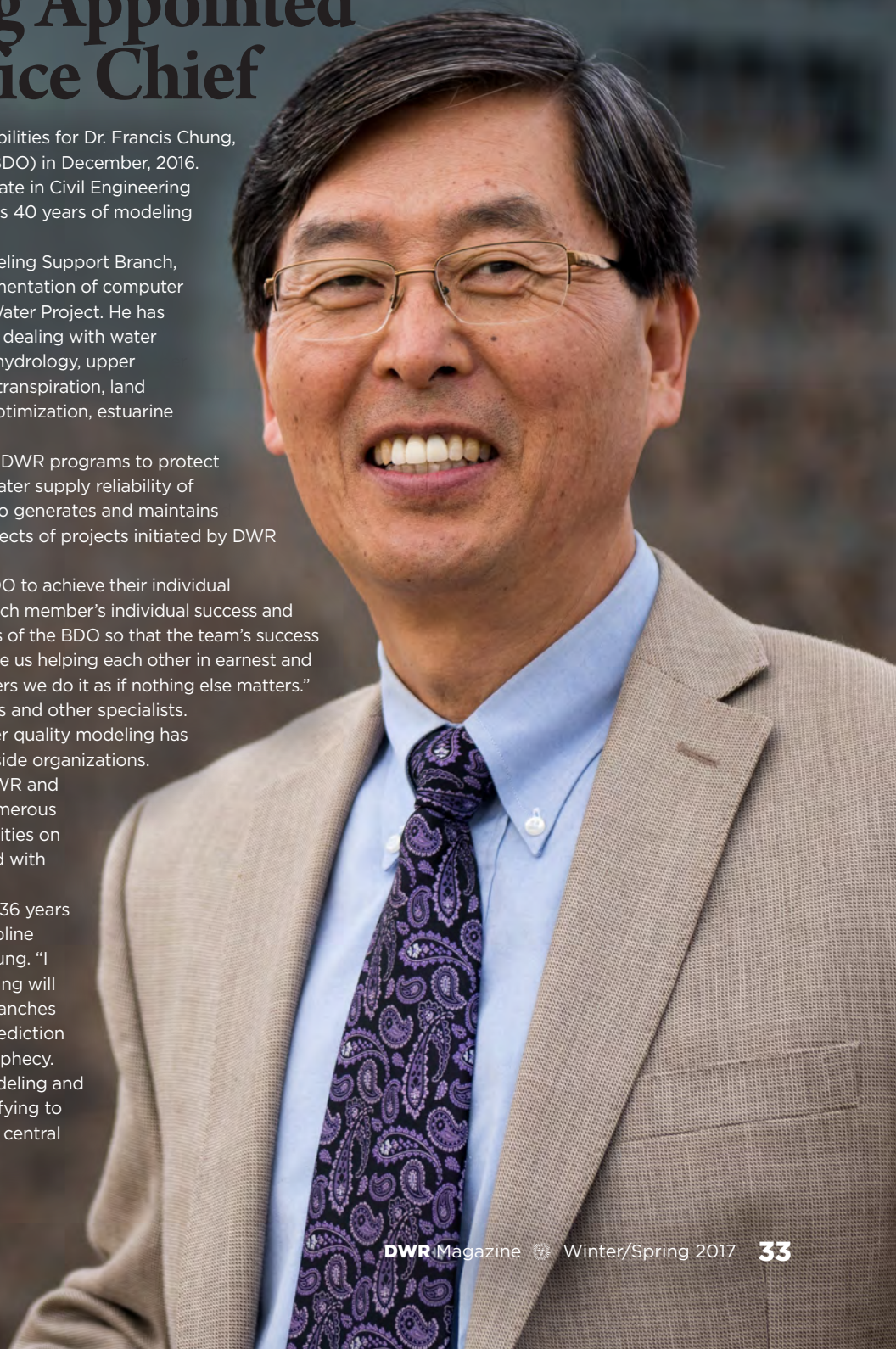
"I would like to facilitate all members of the BDO to achieve their individual excellence at their fullest capacity, to galvanize each member's individual success and channel that success into the goals and objectives of the BDO so that the team's success becomes possible," said Chung. "I would like to see us helping each other in earnest and with kindness so when we offer assistance to others we do it as if nothing else matters."

The BDO has a staff of 84 engineers, biologists and other specialists.

Chung's passion for civil engineering and water quality modeling has long been recognized by DWR as well as by outside organizations.

In addition to providing numerous models for DWR and other agencies, Chung has been published in numerous publications, has lectured at a number of universities on topics such as general modeling and has assisted with projects in Mexico City, Cairo and Korea.

"When I began my career fresh out of college 36 years ago with DWR, modeling was a rather new discipline in Civil and Environmental Engineering," said Chung. "I then in my limited wisdom predicted that modeling will continue to move to the center stage in many branches of engineering. Today, I think in hindsight that prediction turned out to be somewhat of a self-fulfilling prophecy. Many branches of engineering now resort to modeling and perhaps more so in water engineering. It is gratifying to see that modeling is playing more and more of a central role in many projects within DWR." 💧



New Hires

Nathan Ahlers
Flood Management
Utility Craftworker Apprentice

Robert Arriola
Southern Field Division
Junior Engineering Technician

Heat Auble
San Luis Field Division
Utility Craftworker

Mark Avila
Southern Field Division
Utility Craftworker

Daniel Bates
Delta Field Division
HEP* Operator Apprentice

Carlos Blancas
South Central Region
Engineer

Adam Blank
Flood Management
Utility Craftworker Apprentice

Timothy Brennan
Oroville Field Division
HEP* Operator Apprentice

Benjamin Brezing
Statewide Integrated Water Management
Engineering Geologist

Steven Bridgford
San Luis Field Division
HEP* Operator Apprentice

Hung Man Chow
Fiscal Services
Accounting Officer

Bryan Coker
Flood Management
Utility Craftworker Apprentice

Jacob Corbin
Human Resources
Training Officer I

Ranita Dalton
Human Resources
Personnel Specialist

Molly Daniels
Executive
Associate Governmental Program Analyst

Stephanie De Anda
Human Resources
Personnel Specialist

Lionel Flores
Southern Field Division
Utility Craftworker Apprentice

Andrew Fong
Operations and Maintenance
Electrical Engineer

Terry Franklin
Oroville Field Division
HEP* Mechanic Apprentice

Dustin Goularte
Delta Field Division
Junior Engineering Technician

Erin Gross
Safety of Dams
Staff Services Analyst

Gena Harmonson
Executive
Business Service Assistant

*Hydroelectric Plant



CELEBRATING
25 YEARS OF

Service



Susan Bradley-Hudson
Integrated Regional Water Management
Staff Services Manager I
April 2017



Maricella Flores
Technology Services
Staff Information Systems Analyst
February 2017



Anna Fong
Flood Management
Senior Programmer Analyst Supervisor
February 2017



John Keller
Operations and Maintenance
Senior Hydroelectric Plant Engineer (Supv)
January 2017



James Lee
Environmental Services
Staff Information Systems Analyst
February 2017



Gary Munoz
Environmental Services
Chemist
October 2016



Kent Nelson
Integrated Regional Water Management
Program Manager II
April 2017



Marc Sparks
Southern Field Division
Assistant Utility Craftworker Superintendent
March 2017

No Photo Available

Inez DeOrsene
Executive
Office Technician
March 2017

Pauline Rodriguez
Integrated Regional Water Management
Office Technician (Typing)
February 2017

DWR Management Development Program Graduates of 2016

By Sean Walsh

Twenty-nine graduates of the year-long DWR Management Development Program were recognized at the November Governance Board meeting.

DWR mid-level managers are nominated by their supervisors to participate in this Program that helps them learn more about DWR and develop the tools to become more effective leaders. Throughout the Program, participants are teamed together to develop and complete a project that can be implemented by the Department.

The Program culminates with a 15 minute presentation of their projects to the Governance Board.

"I met people from all walks of DWR life – human resources experts, scientists, engineers, construction supervisors and more," said Kim Gazzaniga of the Division of Environmental Services. "I learned something from everyone and it broadened my perspective. When our paths cross again, it won't be 'work,' but rather a meeting amongst friends."

The five 2016 DWR Management Development Program project teams gave their presentations to the Board and guests. Dean Messer once again served as the Program Mentor.

"It was a dynamic and enlightening experience that will enhance my career, and help me be a better employee," said John Orgera of the Division of Engineering.

Since the Program began in 1995, more than 600 DWR mid-managers have completed the Program. 💧

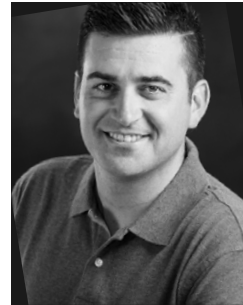
The 2016 Management Development Program team included Left to Right (Front Row) Casey Lund, Jamie Anderson, John Orgera, Lori Lay, Lori Clamurro Chew, Jennifer Hogan, Param Dhillon, Dan Riordan, Karen Louie-Tom **(Middle Row)** Francis Chung, Kamyar Guivetchi, Gary Bardini, Kathie Kishaba, John Chairez, Ron Brault, Frank Lideros, Clay Booher, Jennifer Russo, Kim Gazzaniga, Kacy Kimball, Nate Nelson, Sergio Fierro, Gina Darin, Jessica Alarcon, Craig Cross, Amardeep Singh, Ryan Reeves, Craig Trombly, David Kearney, Ed Wilson **(Back Row)** Fransisca Sugandi, Stephanie Varrelman, Jeannie Kuttel, Eric Koch, Duard MacFarland, Sara Denzler, Jack Miller, Mark Herold, Jeff House, Russell Bowlus, Lincoln King, John Pacheco, Mike Donlon, Dean Messer





APPRENTICE GRADUATES

Congratulations



Sean Savigar
Southern Field Division
Hydroelectric Plant Mechanic
July 2016



Lloyd Boyer
Oroville Field Division
Hydroelectric Plant Mechanic
July 2016



James E. Kortuem, Jr.
Sacramento Maintenance Yard
Utility Craftsworker
July 2016



Robert Mills
San Joaquin Field Division
Hydroelectric Plant Mechanic
August 2016



Laura Souza
Delta Field Division
Hydroelectric Plant Operator
November 2016



James Massey
San Luis Field Division
Hydroelectric Plant Operator
November 2016



Kelly Kolding
San Luis Field Division
Hydroelectric Plant Operator
November 2016



Steve Currie
Southern Field Division
Hydroelectric Plant Operator
November 2016



Brendon Owens, Jr.
Southern Field Division
Hydroelectric Plant Operator
November 2016



Wesley Weddle
Sacramento Maintenance Yard
Utility Craftsworker
November 2016



Bradley Cacciabarne
San Joaquin Field Division
Hydroelectric Plant Operator
December 2016



Jose Chavez
Delta Field Division
Hydroelectric Plant Electrician
January 2017



John Rea II
Delta Field Division
Hydroelectric Plant Mechanic
February 2017



Nicholas Morgan
Southern Field Division
Hydroelectric Plant Electrician
April 2017

The DWR Operations and Maintenance's Apprentice Program graduated 14 apprentices in the last year. The program created in 1971 has trained 407 hydroelectric plant (operators, engineers, mechanics) and 110 utility craftsworker graduates. The civil maintenance program for utility craftsworker was launched in December of 1980. Of the 517 graduates, about 300 of them graduated in the last two decades.

For Apprentice Program information, visit
<http://water.ca.gov/apprenticetraining/>

Delta Levees Program Honored

DWR's Delta Levees Program Team was awarded a unit citation in 2016 for its outstanding contribution in providing financial and technical assistance to local levee maintaining agencies in the Sacramento-San Joaquin Delta. The program has provided bond funding annually to nearly 70 Reclamation Districts in the Delta for levee maintenance and rehabilitation on 700 miles of levees that provide safe passage of flood waters, protect municipal water supplies, protect freshwater pathways and provide support for the Emergency Drought effort.

CITATION RECIPIENTS

Delta Levees Program team includes (Front Row) Dave Chima, Tony Mejia, Karimi Arao, Andrea Lobato, Rebecca Barron, Warren Gayou, Maribel Velazquez and Felipe Garcia.

(Back Row) Bobby Jafarnejad, Carlous Johnson Jr., Andrew Bambauer, Jon Wright, Sandra Maxwell, Robert Charney and Justin Logan.

New Hires

Sheila Heaton
Central Valley Flood Protection Board
Office Technician (Typing)

John Herrel
Delta Field Division
HEP* Electrician I

Matthew Hodge
Flood Management
Utility Craftworker Apprentice

Bonnie Irving
Environmental Services
Environmental Scientist

Elizabeth Jimenez
Human Resources
Office Technician (Typing)

Shelly Johnson
Executive
Executive Assistant

David Johnson
Delta Field Division
Utility Craftworker

Conor Keely
Southern Field Division
HEP* Mechanic Apprentice

Matthew Kopacz
Oroville Field Division
HEP* Electrician Apprentice

Nicole Lambirth
Human Resources
Personnel Specialist

Christopher Lopes
San Luis Field Division
Utility Craftworker Apprentice

Dale Luckett
Southern Field Division
Utility Craftworker

Paul Magana
San Luis Field Division
HEP* Mechanic Apprentice

Isabel Manwaring
Fiscal Services
Accountant Trainee

Chandler Martin
San Joaquin Field Division
HEP* Mechanic Apprentice

Ethan Matthes
State Water Project Power and Risk
Electrical Engineer

Ryan McKinney
Public Affairs
Television Specialist

Rikki Metcalf
Human Resources
Personnel Specialist

Alex Muraoka Fong
Environmental Services
Staff Services Analyst

Wendy Namisnik
Public Affairs
Information Officer II

Anna Opalka
Public Affairs
Information Officer I

Leah Parrilla
San Joaquin Field Division
Senior Environmental Scientist

*Hydroelectric Plant

Retirement



It's not every day that one gets the opportunity to not only be successful in a dream job while also following in a parent's career path.

This was the case for DWR's Chief of Mechanical Engineering Services **Farshid Falaki**, who retired from the Division of Operations and Maintenance after more than 35 years with the Department.

"At the beginning, I gravitated toward Mechanical Engineering because my father was a Mechanical Engineer working for an Oil Company in Iran," said Falaki. "After enrolling in courses and doing some site visits of power plants in college, I knew I needed to be a mechanical engineer. As a mechanical engineer, you can build things that you can see, touch, feel and hear as you witness changing the world for the better one project at a time."

While attaining his Mechanical Engineering degree at Sacramento State, Falaki pictured his dream job to be at a major oil company. As a result of DWR recruiting him in 1981 as a

Mechanical Engineer for the Division of Engineering, Falaki's career took him on another path that he never regretted.

"After I got a taste of the type of work that is done at DWR, I realized that the work we do is a lot more rewarding than the work any corporation could possibly offer me," said Falaki. "However, at the end of the day, what really kept me at DWR was the people, where I found myself surrounded with some of the most professional people."

When asked about the most memorable project he was involved in throughout his career, Falaki recalled the pump replacement project for the State Water Project's Edmonston Pumping Plant, which has "some of the largest pumps in the United States."

"We designed the pumps to be robust enough to operate for the next 50 years with minimal maintenance, but at the same time, with a very high efficiency, given that the power requirement of Edmonston Pumping Plant approximated the power requirement of a town," said Farshid. "We successfully replaced four pumps and they became operational by 2006. It was extremely rewarding to listen to the pumps humming quietly as they are operated and to know that we met every objective that we had set for ourselves."

In addition to publishing four technical reports and articles, Falaki became involved in more than 40 engineering projects, including pump and turbine projects that took him to Japan and Norway several times.

"There are not that many organizations in the United States where someone could build a career in the same office or department for 35-plus years," said Falaki. "This shows the level of professionalism of the people that work here and that the heart of the organization is in the right place."

In retirement, Falaki looks forward to traveling, spending more time with his family, and beating his record of number of 100 mile rides per year, which is one of his longtime hobbies. "I've been earmarked by my daughter to help home school my grandchildren in science," said Falaki. His lessons may even plant the seeds for the next generation of engineers in his family.

Howard Berman

enjoyed being the face, voice and historian of DWR for generations of visitors to the Department's Romero Overlook Visitor's Center, but now has retirement plans that combine travel and history.

The people Berman educated about the State Water Project (SWP) and DWR in general numbered as many as 150,000 a year.

Berman retired as Guide II from the San Luis Field Division 42 years after signing on with DWR at the Castaic Lake Visitors Center north of Los Angeles.

"This was the greatest job to have," said Berman. "I couldn't have asked for more. I found it by accident after reading a bulletin board while registering for a night school course."

Knowing little about the SWP before joining DWR, Berman took it upon himself to learn as much as he could about the Department and the San Luis Joint-Use Complex by studying manuals, bulletins, reports and quizzing staff members involved in different projects.

Berman moved to Romero Overlook in Gustine in 1976, where he was promoted to Guide II and continued playing host to visitors from around the world, including such dignitaries as Governors Edmund G. "Pat" Brown and Arnold Schwarzenegger, Secretaries of the Interior James Watt and Bruce Babbitt and DWR Director William Gianelli.

With a spectacular view of the nation's largest off-stream reservoir – San Luis Reservoir, Romero Visitors Center offered Berman a unique workplace. Romero Visitor Center, unlike DWR's two



other visitor centers, displays information about the San Luis Joint-Use Complex that was created to combine State and federal operations.

Originally from Syracuse, New York, Berman moved from Plattsburg Air Force Base in Plattsburgh, New York to Vandenberg Air Force Base near Lompoc, California in 1965 while serving the Air Force. After moving to Los Angeles in 1966, he earned a degree in history from California State University, Northridge.

Among Berman's travel destinations are Hawaii, and – always the history buff – the burial sites of American presidents.

New Hires

Jacob Pierson

Delta Field Division
Utility Craftworker Apprentice

Stephanie Ponce

Flood Management
Environmental Scientist

Oren Richardson

San Joaquin Field Division
Utility Craftworker

Kristoffer Richcreek

Business Services
Materials and Stores Specialist

Albert Romero-Zamora

Southern Field Division
HEP* Mechanic Apprentice

Jennifer Ruffolo

Executive
Program Manager I

Bryce Russell

North Central Region
Engineering Geologist

Gary Saxton

Southern Field Division
HEP* Electrician I

Benjamin Silva

San Luis Field Division
HEP* Operator Apprentice

Michelle Silva

State Water Project Analysis
Office Technician (Typing)

Jacob Souza

San Luis Field Division
HEP* Electrician Apprentice

Eric Taylor

Oroville Field Division
HEP* Mechanic Apprentice

Tina Termado

Southern Region
Management Services Technician

Erik Tiedeman

Delta Field Division
HEP* Operator Apprentice

David Torres

Flood Management
Engineer

Ricardo Trezza

Statewide Integrated Water Management
Environmental Scientist

Sherrie Vitt

Technology Services
Systems Software Specialist III

Darion Williams

San Joaquin Field Division
HEP* Operator Apprentice

Christopher Williams

Delta Field Division
Utility Craftworker

Brandon Wood

South Central Region
Junior Engineering Technician

Candice Yang

Business Services
Office Assistant (Typing)

*Hydroelectric Plant

New Hires

Joyce Yerby
Operations and Maintenance
Associate Telecommunications Engineer

Promotions

John Amabile
San Luis Field Division
HEP* Electrician II

Justin Ander
Technology Services
Associate Information Systems Analyst

Joe Arostegui
Technology Services
Systems Software Specialist III

Jesus Bonilla
Southern Field Division
HEP* Mechanic II

Aaron Bonner
Southern Field Division
HEP* Mechanic II

Russell Bowlus
Safety of Dams
Supervising Engineer

William Brackney
Operations and Maintenance
Supervising Control Engineer

Bradley Cacciagarne
San Joaquin Field Division
HEP* Operator

Melanie Calastro
Operations and Maintenance
Associate Governmental Program Analyst

Danny Campos
Southern Field Division
Water Resources Technician I

Gavin Chan
Fiscal Services
Associate Budget Analyst

Jamie Cole
Executive
Staff Services Manager II (Managerial)

Lorraine Costanzo
Southern Field Division
Chief HEP* Operator

Jana Coyle
Human Resources
Staff Services Analyst

Vojislav Cvijanovic
Safety of Dams
Senior Engineer

Devin Driggs
San Joaquin Field Division
Associate Governmental Program Analyst

Yao-Hsiang Fock
State Water Project Analysis
Supervising Engineer

Lisa Freitas
Delta Field Division
Associate Governmental Program Analyst

Calysta Gable
Operations and Maintenance
Staff Services Analyst

Vivian Gaxiola
Integrated Regional Water Management
Engineer

*Hydroelectric Plant

Carl and Sarah Torgersen, both veterans of field division as well as headquarters duty, capped off their respective DWR careers in December as Chief Deputy Director in Executive and Staff Services Manager II in Operations and Maintenance.

Carl and Sarah's January 12 retirement celebration at Sacramento's Tsakopoulos Library Galleria – where Carl presided over State Water Project (SWP) contract extension negotiations two years ago – drew guests from headquarters and field divisions.

A native of New York, Carl came to California in 1976 after serving three years in the U.S. Army in Germany.

"After freezing in a foxhole on the Czechoslovakian border, I decided I wasn't going

back to New York," Carl said.

Carl, a Mechanical Engineering graduate from Sacramento State University, held various positions as a Warehouse Worker with the California departments of General Services and Education and as a Student Assistant with the Sacramento Municipal Utility District.

He joined DWR's Division of Design and Construction (now Engineering) in 1981 as a Mechanical Engineer for the Mechanical Design Branch. Carl worked on the Coastal Branch Aqueduct, Hyatt Refurbishment, Suisun Marsh Salinity Control Gates, East Branch Enlargement and Harvey O. Banks Delta Pumping Plant Phase II.

Moving to the San Luis Field Division in 1996, Carl became Chief of the Engineering Branch, then Field Division Chief from 1996 to 2000, over-



seeing more than 120 employees in the management of the San Luis Joint-Use Complex, which includes the largest off-stream reservoir in the United States.

"Working in the field divisions is rewarding because it's hands-on and you are able to actually see the results of your team's efforts," Carl said.

By 2001 and the California energy crisis and 9/11, Carl had become Chief of the SWP Operations Control Office, leading the planning of water and power operations. Moving up again, he was Chief of the Division of Operations and Maintenance from 2006

to 2011, leading more than 1,100 employees statewide in SWP operations.

In 2011, Carl joined Executive as Deputy Director of the SWP. "Since my appointment as State Water Project Deputy Director, we as a department have been able to greatly enhance our safety program," Carl said. "Additionally, we were able to address compensation issues for trades and crafts classifications and initiated the Financial Management Enhancement Project to con-

tinue enhancement of the management of the finances of the State Water Project."

In 2015, Carl was appointed Chief Deputy Director. "As Chief Deputy Director, I've gained a greater appreciation for the complex efforts that the Department is engaged in to achieve its goals," Carl said.

Although Carl and Sarah met while working at San Luis Field Division, their paths did not converge until they volunteered at the Jazz Festival. The rest is history.

Like Carl, Sarah's 34 years of State service were spent mostly at DWR. After working in high school for Parks and Recreation as a Park Aid at San Luis Reservoir, she joined DWR's San Luis Field Division as an Office Assistant in 1984. She became an Administrative Officer in 1992.

Sarah's promotion to Administrative Officer II in 2001 took her to Delta Field Division, where she supervised and administered policy and procedures for 132 employees who cover the needs of five pumping plants, four reservoirs, four dams and 115.6 miles of aqueducts. She provided administrative support for areas, such as water supply, energy and flood emergency.

Although Sarah never expected to leave Delta Field Division in Byron, her new position as Staff Services Manager II led her to the Division Operations and Maintenance's headquarters in Sacramento.

"I enjoyed helping people find solutions to their problems," said Sarah. "I've been fortunate to work with really good people throughout my career both in the field division and at headquarters."

As they journey into retirement, Sarah and Carl, who are Manteca residents, will not only reduce their daily miles traveling to Sacramento, they plan to continue volunteering at professional golf events, such as the Pebble Beach and Silverado tournaments. Along with spending time with their four children and twin grandsons, they will spend more time enjoying the Giants games and traveling in their new motorhome "The Beast."

And, of course, keeping tabs on the Department and former colleagues by reading *DWR Magazine*.



Promotions

Raymond Gomes

San Luis Field Division
Materials and Stores Specialist

Lester Grade

Northern Region
Senior Engineer

Steven Haggard

Delta Field Division
Utility Craftsworker Supv.

Rebecca Heilman

San Luis Field Division
Water Resources Technician I

Michael Hindman

Southern Field Division
Utility Craftsworker Supv.

Kate James

Oroville Field Division
HEP* Operator Apprentice

Kenneth Johnson

South Central Region
Senior Engineer

Cody Kimball

Engineering
Senior Engineer

John Knittel

Delta Field Division
HEP* Mechanic II

Kelly Kolding

San Luis Field Division
HEP* Operator

Sarah Lesmeister

Environmental Services
Senior Environmental Scientist

Hong Lin

Integrated Regional Water Management
Supervising Engineer

Brett Lowes

San Joaquin Field Division
HEP* Technician III

Tricia Machado

Business Services
Associate Governmental Program Analyst

Gregory Mar

Executive
Associate Governmental Program Analyst

Katherine Marquez

Executive
Program Manager II

James Massey

San Luis Field Division
HEP* Operator

Bruce Meiers

Delta Field Division
HEP* Mechanical Supv.

Hany Michael

Engineering
Senior Engineer

Krysl Montemayor

Bay Delta
Office Technician (Typing)

Donald Nipper

Southern Field Division
HEP* Technician III

Trudy Payne

Oroville Field Division
Water Services Supervisor

*Hydroelectric Plant

Maybe the teenage **Jonathan Mulder** had no life plan in mind, but the evidence suggests otherwise.

Mulder retired at the end of last year as an Engineering Geologist in Red Bluff's North Regional Office. Discussing his career recently, he mentioned something from his teen years that hinted where his life might lead.

"It was probably as a 14-year-old that I got my geology merit badge in Boy Scouts," he recalled. Geology was an interest when his family had a cabin near Lassen Volcanic National Park.

Even so, his first merit badge on his way to becoming an Eagle Scout was for beekeeping, and he managed 80 hives while in college. Figuring beekeeping might not be lucrative, Mulder majored in geology at Sacramento State University.

"I first started out as a well site geologist in oil and gas," he said, "but I remembered something my mother said: 'Water is the important thing.' That seemed right, and in 1986, I joined the State Water Board as an Associate Engineering Geologist."

By 1999, DWR had begun planning for a new surface reservoir near Sites northwest of Sacramento. Mulder joined DWR to work on the Sites study and logged more than 20 core holes along the dam's proposed axis looking for faulting, shear zones and the rock types found down below.

Going down below is what Mulder does in his spelunking hobby. Mulder said he cut his teeth as a caver in the Angels Camp and San Andreas foothills area and took up caving after initially being a rock climber.

"Instead of being on a cliff and looking at the same view all day, in caving you go around a corner and see something new," he said. "There's a sense of exploration in caving."

It seems like a perfect hobby for a geologist. Mulder said caving puts you face to face with subterranean layers of rock and even fossils sticking out of passageways. Caving has taken him to Belize to map caves and photo-document artifacts and skeletal remains from the Mayan culture.

Mulder's retirement plans include continuing to participate in the Professional Engineers in California Government group, for which he's been a statewide vice president, and working on his own 10-acre walnut orchard in Durham south of Chico.

"I'm a gentleman farmer," he said. "I leave it to a neighbor down the road to actually manage the orchard," although Mulder said he's involved in pulling out old unproductive trees and planting new ones.

"It's amazing what the University of California, Davis is doing with agriculture," he said, with obvious relish for the job ahead.





DWR's Northern Region Office Watermaster leader, **Shawn Pike**, a Senior Engineer, retired July 2016 after 30 years of State service with the Department.

Pike joined DWR as a student assistant in 1986 at the Red Bluff Northern Region Office, and two years later he was hired on as a junior civil engineer.

Throughout the years, he worked on a wide variety of research projects including the Instream Flow Incremental Methodology (IFIM) Studies, Hydraulic Analysis of Lindo Channel and the North of the Delta Offstream Storage project.

"I believe the projects I was a part of helped improve the management of water resources in California," said Pike.

"What I enjoyed about my time with DWR were the people I worked with," said Pike. "I have friends from 30 years ago when I started."

His work on the Sacramento River Geographic Information System (GIS) in 1994 earned him a Meritorious Service Award. In 1996, he was presented an Outstanding Professional Accomplishment award and a State Superior Accomplishment award for his work on the Sacramento Valley Wetlands Contract GIS Model and Report. His participation on the Proposition 50 Integrated Regional Water Management Grant

Program Team contributed to the Team's 2007 Unit Citation Award.

"Next to coworkers, I most enjoyed working with and for the water right holders under State Watermaster Service. DWR regulates court decrees so they get their correct water rights all season long."

Pike spent his final 11 years with DWR leading the State Watermaster Program.

"With our great team of Watermasters, the program took great strides in modernizing the way we operate and document DWR's efforts related to providing watermaster service," Pike said.

Pike was committed to developing and maintaining a safe, energetic and positive workplace.

"I was also a Watermaster on Hat and Burney Creeks during the time I led the Watermaster Program," said Pike. "Watermaster Service was instituted in the 1920's to keep people from fighting, sometimes shooting each other, and overwhelming the courts with lawsuits. Those are still the reasons Watermasters are needed."

DWR has served more than 1,000 water right holders in nine counties, and still provides service in six counties today.

Shawn plans to spend his retirement traveling and spending time with his grandchildren.

Promotions

Amanda Peisch-Derby

South Central Region
Senior Engineer

Andrew Perales

Delta Field Division
HEP* Technician II

Noe Perez

San Joaquin Field Division
HEP* Electrical Supv.

Dominic Perneti

San Luis Field Division
Utility Craftworker Supv.

Gus Platis

Engineering
Senior Structural Engineer

Reynalou Reyes

Public Affairs
Associate Governmental Program Analyst

Randall Rivera

Operations and Maintenance
Water and Power Dispatcher

Justin Robinson

Oroville Field Division
HEP* Electrical Supv.

Leon Robinson

Southern Field Division
HEP* Mechanic II

Joseph Rodriguez

Operations and Maintenance
Water and Power Dispatcher

Frank Ruiz

San Luis Field Division
Utility Craftworker Supv.

Raymond Santiago

San Joaquin Field Division
HEP* Operator/Apprentice

Pedro Santos

Operations and Maintenance
Senior Telecommunications Engineer

Cheryl Selby

Business Services
Associate Governmental Program Analyst

Samantha Sierra

San Joaquin Field Division
Administrative Officer II

Brandon Silva

San Luis Field Division
Utility Craftworker Supv.

Yvonne Simmons

Delta Field Division
Administrative Officer II

Nadine Small

Environmental Services
Environmental Scientist

Beverly Snipes

State Water Project Power and Risk
Administrative Officer II

Laura Souza

Delta Field Division
HEP* Operator

Jonathan Stahlke

Southern Field Division
HEP* Electrical Supv.

Emily Stanley

Operations and Maintenance
Office Technician (Typing)

*Hydroelectric Plant

Promotions

Jannette Stetson-Buck

Southern Field Division
Business Service Assistant

Bao-Duy Ta

Engineering
Senior Engineer

Bich Hien Thach

State Water Project Power and Risk
Electrical Engineer

Mary Valdez

Operations and Maintenance
Water Services Supervisor

Arthur Valencia

Engineering
Construction Supervisor II

Mitchell Waller

Environmental Services
Senior Environmental Scientist (Supv.)

Ruth Watson

Human Resources
Training Officer I

Wesley Weddle

Flood Management
Utility Craftworker

Clinton Womack

Oroville Field Division
Water Resources Engineering Associate

Tou Lia Xiong

Business Services
Associate Governmental Program Analyst

Retirements

Russell Allenbaugh

Operations and Maintenance
Senior Control Engineer (Supv.)

Fernando Arambula

San Joaquin Field Division
HEP* Mechanic I

Allen Bennett

Southern Field Division
HEP* Electrician I

Carlo Berardini

San Joaquin Field Division
Utility Craftworker

Olen Campbell

San Joaquin Field Division
HEP* Operator

Diana Corbeil

Engineering
Office Technician (Typing)

Jaime De Santiago

Southern Field Division
Engineer

Jorge Diaz

San Joaquin Field Division
Utility Craftworker

Angelo Garcia

Operations and Maintenance
Water Resources Engineering Associate

Cheryl Garrett

Business Services
Associate Governmental Program Analyst

Johnnie Gomez

San Joaquin Field Division
Utility Craftworker Supv.

Jain Fong

Supervising Hydroelectric Power Utility Engineer, spent his nearly 29 years at DWR working for Flood Management, Operations and Maintenance (O&M) and the California Energy Resources Scheduling (CERS).

Fong joined DWR in 1988 as an Associate Control System Engineer for the Division of Flood Management's California Data Exchange Center (CDEC). He was responsible for updating the CDEC's data center and acquisition systems.

A year later, Fong transferred to O&M where he maintained, updated and modernized both control and communication systems used in the Project Operations Control (POC) Center for the State Water Project. He was selected to be a member of a project team overseeing the implementation of the Interim Water Operations Center (IWOC) in 1994.

I was responsible for preparing the POC systems for the move of the POC to the IWOC," said Fong. "I laid out the system power requirements and worked with the outside consultants to define and implement the infrastructure needed to support a control center. Prior to taking occupancy of the building and moving the systems, I worked with the U.S. Bureau of Reclamation and the National Weather Service engineers to test the startup of the building infrastructure."

In 1995, Fong was promoted to Senior Hydroelectric Power Utility Engineer, a position in which he would experience one of his most rewarding projects. He was selected in 1997 to serve as DWR's liaison in a knowledge transfer partnership with the Changjiang Water Resources Commission based in China regarding a water transfer project.

"This allowed me to be exposed to the ground floor of a major hydro development project and to



compare my knowledge of coordinated water and power operations with engineers working in a much different environment," said Fong.

Fong became Supervising Hydroelectric Power Utility Engineer in 1999 with O&M's Operations Control Office. In January of 2001, he was part of the initial emergency response team tasked to "keep the lights on" during the California energy crisis. After joining CERS, he became a key player in addressing the 2001 California energy crisis as an emergency response team manager.

With his December retirement from CERS, Fong looks forward to increasing his philanthropic efforts with volunteer and humanitarian work.

"I plan to continue volunteering in the community by helping the elderly Chinese with their needs, and getting back into Habitat for Humanity," said Fong.

*Hydroelectric Plant

Roger Linder leaves DWR after more than 38 years to pursue his dreams of becoming a Rock Star. Or so he wishes.

Back in 1978, Linder had ambitions to join a band, write music and become famous, but fate led him on a different path, that of a member of the Information Technology team at DWR, where he has had a very rewarding career. His career path that began as a Graduate Student Assistant pursuing his Master's Degree in Computer Science at Sacramento State University took him to being a Systems Software Specialist III when he retired in December.

From using key-punched 80 column data cards to the latest technologies, he has seen many significant changes in the overall industry, and how DWR has maintained the leading-edge approach.

"Programming has always been a big part of my life," said Linder, who enjoys developing websites. "Programming and writing music are a creative talent that allows you to start with nothing and end with something that is useful in some way."

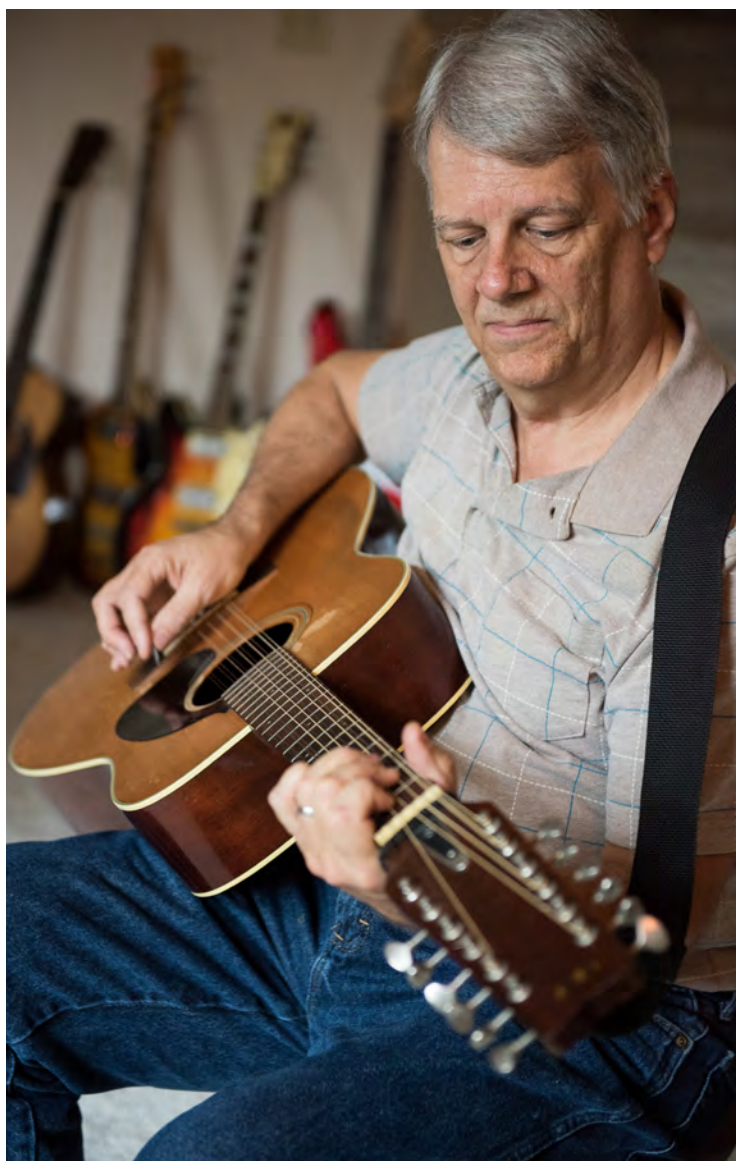
Linder has developed hundreds of thousands of lines of computer code and developed procedures and applications that helped make the end user and system administration tasks much easier. He helped usher DWR into the Internet era with network installations and some of the earliest web applications. His most recent duties included support for critical systems for transfer of personnel, payroll and other fiscal data between DWR and the State Controller's Office, operation and support for the California Irrigation Management Information System and maintaining and developing software for the F5 internet proxy device.

Linder, a lifetime blood donor (nearing 20 gallons), has provided support for DWR's blood drives more than 15 years, serving as drive chairperson for the

past several years. He plans to continue donating after retirement. He is a member of the Capital Communicators Toastmasters Club, and served as the club's President, Vice President Education and as an Area Governor.

Linder cherishes his 40-year marriage to his wife, Cece, and their two adult sons, Matthew and Bradley. Having traveled to all of California's counties and all fifty states, he hopes to continue to pursue travel opportunities. He is also tracing his family tree and enjoys tracking down distant cousins on his and his wife's side of the family.

As for the Rock Star thing? He still wants to give it a try. Having written two rock operas, and three novels based on one of them, he figures the opportunities for stardom are still out there. 💧



Retirements

Richard Hernandez
Environmental Services
Chemist

Marilynne Hite
Business Services
Office Technician (Typing)

John Hottinger
Oroville Field Division
Building Maintenance Worker

Mathew Martin
Southern Field Division
Utility Craftsworker

Frank Martinez
Southern Field Division
Utility Craftsworker

James Mason
Southern Field Division
Chief HEP* Operator

Daniel McManus
Northern Region
Supervising Engineering Geologist

Ilona Millhone
Chief Counsel
Associate Governmental Program Analyst

William Muir
San Luis Field Division
HEP* Mechanic I

Ben Nixon
San Joaquin Field Division
Associate Governmental Program Analyst

Michael Nolasco
Operations and Maintenance
Water Services Supervisor

Todd O'Briant
Oroville Field Division
Assistant Utility Craftsworker Supt.

Keith Oguro
Operations and Maintenance
Associate Telecommunications Engineer

Victor Pando
Delta Field Division
HEP* Mechanic II

Donald Price
San Luis Field Division
HEP* Mechanical Supv.

Nancy Quan
State Water Project Analysis
Supervising Engineer

Cornelio Quedado
Engineering
Water Resources Engineering Associate

James Scarborough
Oroville Field Division
Water Resources Engineering Associate

Linda Scherr
Executive
Staff Services Manager II (Managerial)

Kathleen Simmons
Southern Field Division
Guide II

Keith Swanson
Flood Management
Chief

James Thomas
San Luis Field Division
Chief

Charles Tyson
Integrated Regional Water Management
Program Manager II

*Hydroelectric Plant

Sylvia Blake, a retired Executive Secretary in the Division of Planning (now called the Bay-Delta Office) and Central District (now the North Central Region Office) passed away on October 21, 2016.



Sylvia's 53 years with the State began in 1956. She worked more than 31 years as a Stenographer and Secretary for the Land and Right of Way Unit, Division of Planning and Central District.

Sylvia started in DWR, then transferred to the Department of General Services until 1966. After returning to DWR as an Intermediate Stenographer, she received numerous commendation, appreciation and thank you letters and DWR awards. She worked in the Land and Right of Way unit for 10 years assembling and finalizing numerous appraisal reports, brochures, sales documents and transmittal letters. In 1980, Sylvia served on the Outstanding Office Services Accomplishment Award review panel. In the early 1980's, Sylvia was assigned to the Delta Levees Investigation Study where she supported the Bulletin 192-82 production that outlined the Department's strategy to rehabilitate the Delta levees to complete an assignment given to DWR by the Legislature. In 1988, Sylvia was assigned to provide administrative support to both DWR and State Water Resources Control Board staff that had been assigned to Phase I of the Bay-Delta Hearings.

After Sylvia's retirement in 1991 from DWR, she worked as a Retired Annuitant in the Division of Planning. After six years, Sylvia transferred to Central District and continued as a retired annuitant until 2012.

Most of her years with the State were with Central District, where she made a lasting positive impression on everyone she met. Sylvia epitomized the definition of an excellent worker and wonderful friend. She displayed competence and skill combined with a caring and thoughtful attitude. She will be sorely missed by all who knew her.

Sylvia, born and raised in the Newcastle area near Auburn, was preceded in death by her husband Bill Blake, who was also a DWR retiree and her son Gary. She is survived by son Roger.

Donald Neudeck, retired Chief of DWR's Flood Operations Branch, passed away at age 91 on February 27, 2017.

After serving in the U.S. Navy during World War II, Neudeck joined the Division of Water Resources (later DWR) in 1954 in the water quality section. After being promoted to Chief of Levee Inspections, he oversaw the maintenance and inspection of various levee projects, prepared annual reports and collaborated with up to 130 reclamation districts in Sacramento and San Joaquin Valley.

By 1970, Neudeck was a major contributor in flood management after being promoted to supervise DWR's Flood Operations Branch, a position he would keep until his retirement. In fact, the civil service classification of "Chief of Flood Operations" was created based upon his skill set, and he was the only person to occupy that classification.

As Chief, he was responsible for managing the State Flood Operations Center, providing flood information to news media and the public, and assisting in the development of flood control policies for State and federal projects. He also worked with outside agencies to provide weather condition and water level monitoring, and spoke at flood training workshops.

Over the span of his career Neudeck played a major role in flood fighting during the epic floods of 1955, 1964 and 1986. The importance of Neudeck's steady demeanor, and ability to concisely communicate key information during a crisis is best illustrated by the fact that during the most crucial days of the Great Flood of 1986, Governor Deukmejian had Neudeck call him directly to provide a flood system status update before leaving the Flood Center for the night.

George (Tom) Roberts, retired DWR Water Resources Technician from Southern Field Division, passed away in October.

Tom, who retired in 2005, worked from 1988 to 1991 as a State Police pilot along the State Water Project. He joined DWR later in the Water Operations Section at Devil Canyon Powerplant, then worked at the Coastal Branch Aqueduct as a Construction Inspector until August of 1998.

"Tom was an accomplished pilot, and worked as a State Police pilot flying the fixed-wing, two-seated airplane on State Water Project surveillance," said Bonnie Duecker of Southern Field Division. "He was dedicated to the safety and security of the SWP long before 9/11."

Tom is survived by his wife Donna of 52 years, two daughters, a son and five grandchildren.

"He had a flair for storytelling, and a heart to help both people and animals," said Duecker.

"Don was a visionary man. As leader of the Flood Operations Center, he had the goal of collecting all flood related information and sharing it with flood management agencies and the public throughout the state," said Naser Bateni. "One of his major accomplishments was establishing, in the wake of the 1964 flood (which hit the north coast of California particularly hard), a 'satellite' flood center at Eureka."



As computer technology advanced during the early 1980s, Neudeck also established the California Data Exchange Center (CDEC), through which State and federal agencies can receive critical hydrologic data in real-time, greatly enhancing their ability to respond to emergency situations. Beginning in the 1970s and into the '80's, Neudeck had been instrumental in expanding the statewide rainfall monitoring and developing the snowpack telemetry system in partnership with the National Weather Service, a tool that would provide essential real-time data for CDEC.

In recognition of his dedication and expertise, Neudeck received DWR's Director's Award in 1981 and many others that were presented by the California Governor's office.

Even after retiring on September 30, 1988 (appropriately at the end of the water year) with 34 years of State service, Neudeck remained close with his colleagues through his membership in DWR's Alumni Club.

Neudeck is survived by his three children Nancy, Chris, and Randall, seven grandchildren and four great-grandchildren.

Denis Rose, retired Staff Counsel of the Office of the Chief Counsel, passed away January 20.

A civil engineering graduate from the Sydney University in 1949, Denis worked for Tasmania government in Australia and Bahrain Petroleum Company before joining DWR.

During the construction of the State Water Project, Rose began at DWR's Southern District as a junior civil engineer in 1963. After becoming associate civil engineer and his admission to the California Bar in 1966, he joined DWR's Legal Office in Sacramento.




As legal counsel to the Reclamation Board, Denis helped negotiate and draft agreements between the Board and the U.S. Army Corps of Engineers or local government agencies to fund and construct new flood control projects. In 1990, he retired from DWR.

He is survived by his two sons and a granddaughter.

DWR Mission Statement

To manage and protect the water resources of California in cooperation with other agencies, to benefit the State's people and to protect, restore and enhance the natural and human environments.



Hydroelectric Plant Mechanic II John Secrest, one of three instructors at the DWR Operations and Maintenance's Apprentice Training Center in Bakersfield, reviews an exam with apprentices. The Apprentice Program created more than four decades ago requires apprentices to complete as many as 22 classes, depending on their selected craft, at the Training Center.



Signs from the community show appreciation for Oroville crews working on the Oroville spillway incident.